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ABSTRACT

The Mid-continent Regional Educational Laboratory's (McREL's) Mid-continent Alliance focuses on technical areas that must be considered by every school system that is serious about reform. This document contains four articles that focus on four important pieces of the school-reform puzzle: (1) standards and benchmarks for learning; (2) learner-centered principles, a foundation for the redesign of instruction and school reform; (3) indicator systems, accountability, and classroom assessment; and (4) a model for an integrated, interdisciplinary curriculum. Policymakers and practitioners must simultaneously consider each of these areas when making decisions. Three tables and one figure are included. (LMI)

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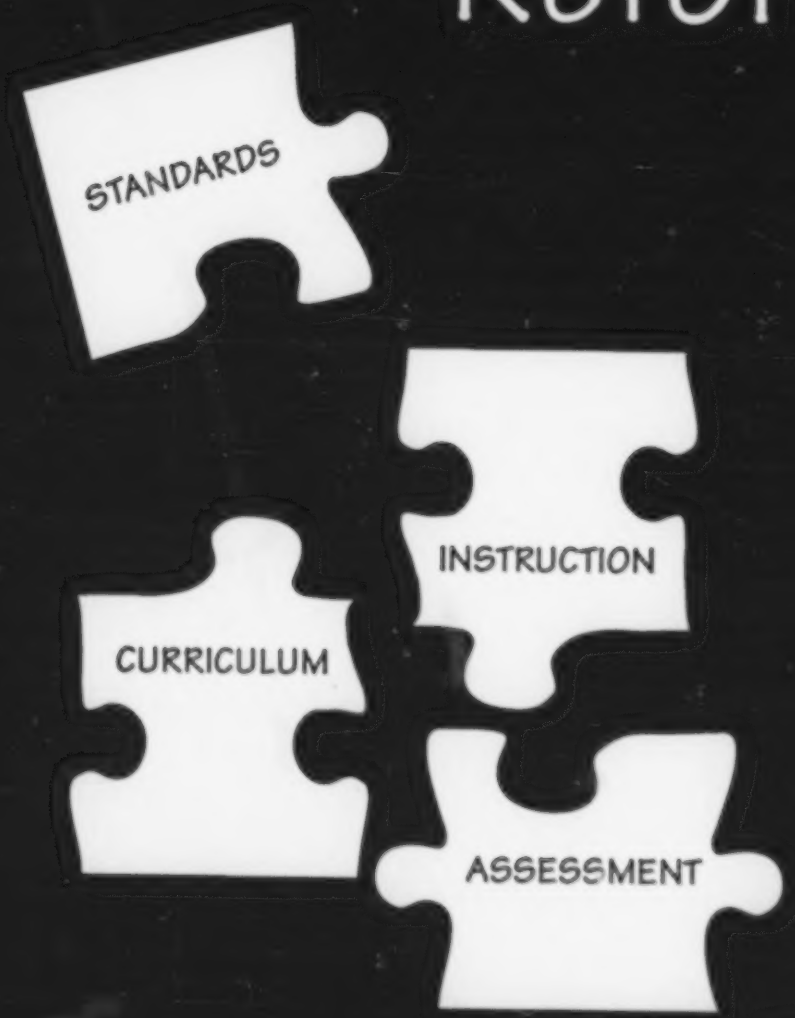

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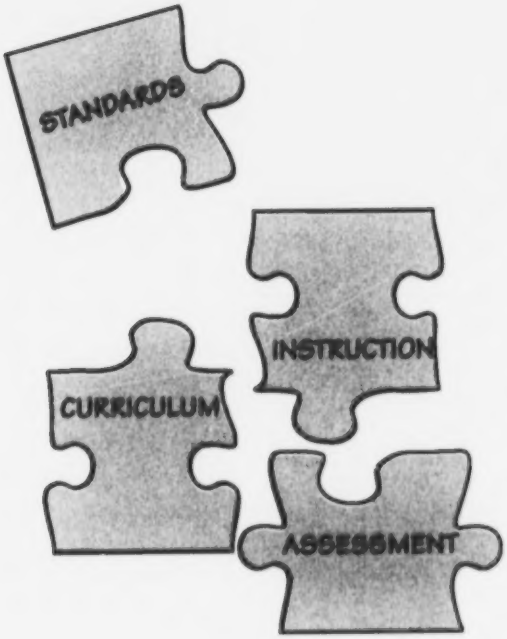

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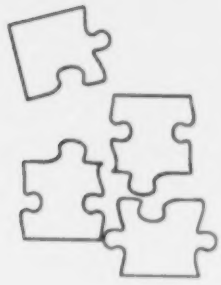

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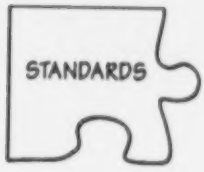

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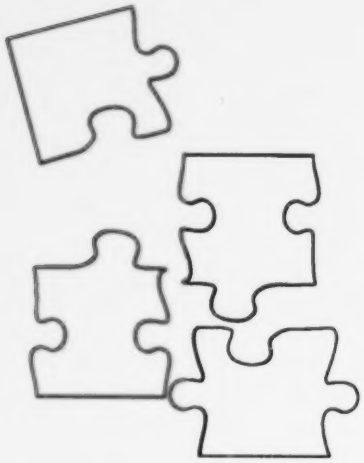


INTRODUCTION

In 1974, Peter Drucker began to write and speak of the coming information age and the impact that it would have on both the American economy and the American workforce. Speculation about what would become essential skills for American workers led almost immediately to discussions about the need for reform of the American system of public education so that employers could be assured that their new employees would possess the skills necessary to be productive in the changing workplace. In 1983, with the publication of *A Nation at Risk*, the rest of the country was drawn into the same discussion about the need for a substantial reform of the American education system that Drucker, Naisbitt, Snyder and others had been forecasting for nearly a decade. *A Nation at Risk* and the spate of reports that followed set the stage for a movement to change, fundamentally, one of the most complex systems in modern society.

Many lessons have been learned in the past decade. Among the lessons learned by educators serious about school reform are the following:

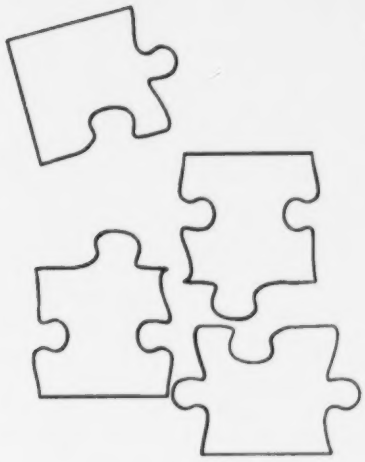
- Reforming the American educational system is a long-term proposition. What many people thought could be accomplished in a relatively short time (from one legislative session to the next) is now understood to take years to accomplish. Fundamental systemic change may take as long as a decade.

- There is no one approach that can be taken to improve the performance of all school systems. Each system has enough unique characteristics and variables that the adoption of a single model that fits all districts is not possible.

- There is not one single, simple, fail-safe intervention that can be introduced into the life of a school system that will result in long-term, substantial, sustainable increases in student achievement. Long-term, substantial, sustainable increases in achievement will result only from systemic change. Systemic change will come only as a result of a combination of effective interventions, skillfully implemented, in the proper sequence, at the right time in the life of the school district.

- There is a combination of interventions that must be considered in any significant reform effort. The combination must include, but certainly is not limited to, use of learner-centered principles; content standards for student learning; school- or district-wide assessment and accountability systems; and the design and use of integrated, interdisciplinary curriculum.

- In addition to the high quality technical work that must be done in the areas listed above, there also is a need for organizational and leadership development, management of the personal transitions that school district employees experience in times of significant organizational change, and the building of public support for reform if quality technical work is to have any long-term positive impact on learning and achievement.



McREL's Mid-continent Alliance focuses on these technical areas that must be considered by every school or school system that is serious about reform. Each of the four articles that follow focuses on one of these technical areas:

(1) standards and benchmarks for learning;
(2) learner-centered principles, which form a base for redesigning instruction as well as other aspects of schooling;
(3) integrated, interdisciplinary curriculum; and
(4) assessment of and accountability for student learning and system effectiveness.

Systemic reform of education at the national, state or local level cannot be accomplished without attention to, informed decisionmaking about and action in all four of these areas. In the terms of our analogy, the school reform puzzle cannot be solved, or put together, without these four pieces.

Another of the lessons learned is that the areas addressed in the articles in this journal are not the only areas that demand attention and efforts for reform. These are not the only pieces of the puzzle. Attention to all aspects of the change process is equally important for successful results.

Readers involved in reform decisions should take note, also, that it is not possible to make decisions in any one of these areas without affecting decisions that have been made or will be made in the others. Changing one piece of the puzzle will affect other pieces. Exactly what decisions get made about the use of content standards may limit the freedom a district has about the use of the learner-centered principles. A strong commitment to full implementation of the learner-centered principles will set parameters for how the content standards may be used in a district. Decisions in both of these areas will drive what a district should do with assessment and may determine what can be done with curriculum integration.

It is the interaction among the consequences of decisions about how to reform schools and school districts that makes the task so complex and challenging. It is, therefore, essential that policy makers and practitioners consider each of these areas simultaneously when making decisions about school reform so that the decisions made about what to do and how to do it in one area can be complementary to decisions made in the other areas. Long term, significant, systemic changes and increases in student achievement can occur when decisions about appropriate technical interventions and change are thoughtfully approached and effectively implemented.

This issue of *Noteworthy* focuses on four very important pieces of the school reform puzzle which educators are working to put together. These four pieces involve the areas of standards, instruction, curriculum and assessment. Again, the puzzle cannot be completed with these four pieces alone; other pieces also are essential. What is more, all the pieces are closely connected. Only when the pieces are put together to form a whole, completed puzzle will the school reform picture become evident.

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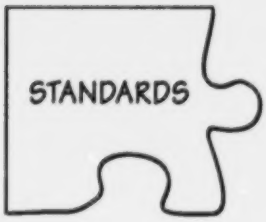


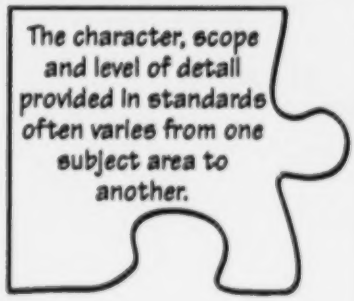
THE WHY, WHAT AND HOW OF STANDARDS

By John S. Kendall and Robert J. Marzano

WHY STANDARDS?

Across the country teachers commonly rely upon textbooks to determine what they should teach in their disciplines. This is so common, in fact, that we could argue that textbook manufacturers have become the de facto standard-setting group for the content areas. Similarly, test publishers, by virtue of the use to which standardized tests are put in school accountability, have provided schools and districts with measures of what students should know and be able to do in order to reach certain minimum standards — testing companies have provided de facto performance standards for our schools. Yet the current system of defacto standards clearly is inadequate. We have entered an age when information grows so rapidly that subject-matter experts are compelled to review their assumptions about the essential knowledge and skills of their disciplines. Additionally, in areas such as the humanities and the arts, there is a need to provide clarity on what it is that makes these disciplines an essential part of education. Experts in the subject areas should provide guidance for determining what students should know and be able to do to prepare themselves for college and the world of work. In short, there is a strong case to be made for the careful and systematic identification of standards in education.

Although there is a national dialogue on the development of standards, clearly there is no consensus across subject-area groups as to what form "standards" should take, or how they should be used. The result is that the character, scope and level of detail provided in standards often varies significantly from one subject area to another. Some subject area groups have argued that the disciplines are so inherently different that a common approach to standards is not possible (Viadero, June, 1993). Yet, regardless of how different the discipline areas might be from one another, they each compete for a common ground: the limited amount of time and resources in the school day. Unless standards and benchmarks are presented in a roughly equivalent and useable format, decisions regarding curriculum or assessment can quickly become problematic. For example, it is difficult for a school or district to articulate a comprehensive set of standards if one subject area describes standards in terms of a performance vignette, as is the case with the work done by the Standards Project for the Language Arts, while another subject area describes standards in terms of specific components of knowledge and skills, as is the case with the mathematics standards developed by the National Council of Teachers of Mathematics. Finally, without a common format for standards, it is not likely that educators can recognize and take advantage of the possibilities for subject-area integration afforded by the commonalities that may be found across subject areas.



Recognizing the problems in this arena, the authors, with the assistance of a number of colleagues at McREL, undertook an ambitious project. After a comprehensive review and analysis of major standards reports in the subject areas, and benefitting from our work with schools and districts, we have developed a model for the systematic identification of standards and benchmarks across disciplines. Using that model we have generated first drafts of standards and benchmarks for the areas of science, mathematics, history and geography (Kendall & Marzano, 1994).

Additionally, we have formulated benchmarks for areas that recently have been identified as important to the world of work: communication (including reading and writing), reasoning, self-regulation, working with others and life-work skills. Updates of our work will continue to be issued as more information becomes available from the standards-setting groups. These updates will include standards in additional areas, such as the arts and health education.

What are Standards?

The first step in the development of this model required clarifying issues that have been largely unaddressed and often unrecognized in the current move towards standards-based education. These issues arise in part from the differing perspectives taken by the subject-area groups and in part from the ways in which schools and districts have adopted a standards-based approach to education. In order to develop an internally consistent model of standards and benchmarks, then, we believed it necessary first to consider, in particular, the seven areas of concern that follow. The model we have formed reflects the perspective we have adopted in each area.

The Literacy versus Expertise Issue

Some groups, such as the National Council of Teachers of Mathematics (NCTM), have developed standards using what might be called a "literacy" model. Such standards serve to ensure that students have a basic understanding of the fundamental knowledge and skills in mathematics that an educated, literate adult should have and be able to use. Still other standard-setting groups, for example the National Council for History in the Schools, work from a more traditional academic model. In this model, it might sometimes appear that academic knowledge is valued for itself, and that the discipline resists the adoption of strictly utilitarian criteria for the selection of content for students.

The differences between academic and literacy models presented in the various documents do not, on close analysis, constitute an insurmountable problem. At the literacy end of the continuum, standards might be described as the minimum requirements of knowledge and skill students should have to function well as adults of the twenty-first century. At the "expertise" end of the continuum, standards are described in terms of the knowledge and skills that, once acquired, would render students "mini-experts" in every field. In fact, as currently articulated in the documents reviewed for this effort, both positions have strong tendencies toward the middle.

In our analysis of documents we adopted the perspective of a literacy approach to content. This was done in the belief that standards and benchmarks, while they should reflect high expectations, should nonetheless be considered essential for all students, whether they enter the world of work directly from high school or go on to higher education.

Content Standards or Curriculum Standards?

A major distinction in the type of standards various groups are identifying is that between content standards and curriculum standards. *Content* standards describe what a student should know and be able to do. *Curriculum* standards are best described as descriptions of what should take place in the classroom; that is, they address instructional techniques, recommended activities, and various modes of presentation as opposed to knowledge and skills. The difference between a content and a curriculum standard is illustrated by the following two statements from the National Council of Teachers of Mathematics (NCTM, 1989) framework. Within that document both statements are presented as standards:

a) recognize when an estimate is appropriate
b) describe, model, draw and classify shapes

Standard *a* describes a skill or ability a person might use solving a "day-to-day" or academic problem. Standard *b*, "describe, model, draw and classify shapes," does not share this characteristic. That is, it is difficult to imagine many situations that would demand the skill of being able to model, draw or classify shapes,

whether to solve an academic or a day-to-day problem. Rather, this kind of activity seems appropriate as an instructional device to help students understand shapes or to provide a way for them to demonstrate their understanding of shapes. It might be said that curriculum standards describe the methods designed to help students achieve content standards.

Our model has content standards as its focus. There are two overarching reasons for this choice. First, content standards describe the goals for individual student achievement, while curriculum standards provide information that contributes to reaching those goals. Second, curriculum standards, which usually focus on activities, projects or techniques, if interpreted rigidly, could leave teachers with little or no room for instructional diversity.

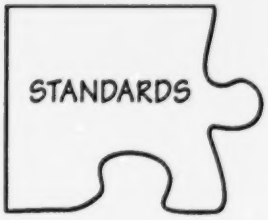
Since our approach has a content (as opposed to curricular) orientation, the standards we identified assume some of the characteristics of content area knowledge. Specifically, the standards identified within this project will generally fall into three broad categories representing the three general types of knowledge as exemplified in Figure 1.

Procedural	Declarative	Contextual
reading a map	democracy	know when to use a map instead of a globe
performing long division	a numerator	model numbers using number line
shooting a free throw	rules of basketball	know when to use man-to-man vs. zone coverage

Figure 1. Types of domain knowledge

In Figure 1, the first column provides examples of procedural knowledge, the skills and processes important to a given content area.

The examples in the second column involve understanding the component parts of knowledge. For example, knowledge of the concept of "democracy" includes understanding that decisions are made by the people, each person has a single vote, votes are weighted equally, and so on. This type of knowledge is commonly called declarative knowledge, the information important to a given content area.



The last column contains items that are not simply declarative or procedural, but specify knowledge in context, information and/or skills that have particular meaning because of the conditions that form part of their description. Like the declarative/procedural distinction, this contextual knowledge is basic; a "piece" that cannot be further reduced without loss of important information. Also, like declarative and procedural knowledge, it reflects a kind of knowing that is primarily useful in the service of some larger goal. Standards derived from the content position, then, will describe the declarative, procedural and contextual knowledge important within a given content area.

Content or Performance Standards?

One of the significant controversies within developing models of standards-based education is whether standards should be content- or performance-based. Some theorists describe standards in terms of knowledge and skill that should be acquired; others describe standards in terms of the tasks in which students demonstrate knowledge and skill by their performance. Performance standards differ from curriculum standards in that, like content standards, they are not designed as activities for the sake of instruction, but rather are descriptions (in this case, via tasks) of what it is students should know and be able to do as a result of instruction.

The content position focuses on clearly defined declarative, procedural or contextual knowledge. The performance position does not ignore the declarative, procedural or contextual knowledge important within content domains; but, by design, a performance task describes a specific application of knowledge and skills.

By virtue of limiting the expression of knowledge and skill to that demonstrated in a particular task, performance standards have a

limited scope and it could take many performance standards to exhaust, if possible, the potential applications for any set of given content knowledge.

Still more problematic, from the point of view of covering important knowledge and skills, performance tasks are rarely transparent as to the knowledge and skills required for their successful completion. To ask students to determine the cost of a shower (Wiggins, 1993, p. 205) may be an excellent, real-world challenge; but, if performance standards are meant to guide the curriculum, it is not likely clear for any teacher or student whether all students, for example, should understand the British Thermal Unit (BTU) prior to attempting the "shower" task.

Conversely, if we have determined through content standards that students should understand BTUs, there are any number of tasks (including the "shower" task) that we could construct to confirm whether the student has this knowledge, and how well the student knows it.

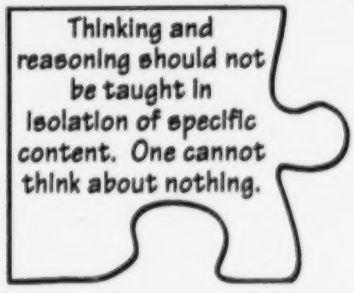
We believe that performance tasks (as standards) make clear how knowledge and skills are useful, but tasks in themselves fail to make clear all that is important. While in this model performance standards are not used to describe knowledge and skill, they will be used in the assessment of content standards. In effect, then, content standards and performance tasks are two interdependent and necessary components of an effective system of standards.

The Role of Thinking and Reasoning

Virtually all of the documents reviewed in our study either implicitly or explicitly acknowledged the importance of emphasizing thinking and reasoning in the articulation of standards. Although there is agreement as to the importance of enhancing thinking and reasoning, there is not much agreement on the manner in which thinking and reasoning should be articulated in standards.

There were three principal ways that thinking and reasoning skills were addressed in the documents reviewed in this project thus far. One approach was to establish a set of standards on generic reasoning. For example, the document *Workplace Basics: The Essential Skills Employers Want* (Carnevale, Gainer & Meltzer, 1991) identifies "Creative Thinking" as one of the sixteen skills that are important to the workplace. Thinking skills identified in this manner are stated as generic mental processes that cut across all content areas.

A second approach can be found reflected in the National Council of Teachers of Mathematics' Curriculum and Evaluation Standards, which articulates a standard entitled "Mathematical Reasoning." Within this category, those reasoning processes presumed to be specific to mathematics, but useful within the various subdisciplines of mathematics, are identified.



Finally, the third perspective is exemplified by the draft of the National Geography Standards (Joint Committee on Geographic Education, 1993) which describes performance standards. Here no set of standards nor any one specific standard addresses thinking and reasoning. Rather, performance standards are described in such a way as to embed thinking and reasoning processes as in the example, "The student can evaluate the related merits of maps, globes and other geographic tools to solve problems."

A cursory review of the literature in cognitive psychology would seem to favor the latter two positions. That is, strong arguments have been made against the isolation of thinking and reasoning skills (Glaser, 1984; Resnick, 1987). However, it is important to note that these arguments focus upon instruction, not upon the identification of standards. That is, the case has been well articulated that thinking and reasoning should not be taught in isolation of specific content. Quite obviously, one cannot think about nothing. Rather, thinking and reasoning processes and strategies must be employed with content, and to use any content other than that important to specific disciplines makes little sense.

However, articulating standards is a different question. As we have argued, one of the primary purposes of standards is to provide educators with direction about the skills and abilities that should be the focus of instruction and assessment. Yet, if important thinking approaches are only found embedded in content, there can be no way to ensure that students have explored content in as many thoughtful ways as possible. Clearly, a hit or miss approach will characterize any effort that does not fully articulate and address the thinking and reasoning skills that should be brought to the study of content. We, therefore, elected to aggregate the various elements of thinking and reasoning into a dedicated set of standards. Our method of reporting, however, should not be misconstrued as a mandate or even a suggestion that thinking and reasoning should be taught in isolation of domain specific knowledge and skill.

Level of Generality

Even a cursory review of the standards generated by different groups reveals different perspectives on the level of generality of a standard. That is, levels of generality differ markedly from one group to another. For example, in an early draft from the National History Standards Project (November, 1992), the following performance standard (Example 1) is presented to cover the general topic of "Revolution and the New Nation" at grades 5-8:

Example 1

To demonstrate understanding of the government created by the Articles of Confederation and its effectiveness, students will be able to::

- *Compare and contrast the powers apportioned to the states and to the Continental Congress under the Articles of Confederation.*
- *Compare and contrast such major accomplishments of the Continental Congress as the Treaty of Paris, the Land Ordinance of 1785, and the Northwest Ordinance of 1787 with the inability of the Congress to deal with problems of national finance and trade.*
- *Explain the importance of the Northwest Ordinance in the development of new states, its restrictions on slavery, its provisions for public education, and its statement of national Indian policy.*

By contrast, Example 2, a draft from the National Council for the Social Studies (NCSS), provides the following:

Example 2

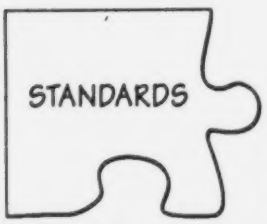
Social studies programs should include experiences which provide for the study of how people in diverse societies create and refine systems of governing so that students can:

Performance standards:

- *examine persisting issues involving the rights, role, and status of the individual in relation to the general welfare.*
- *explain the purposes and describe alternative systems of government.*
- *analyze ideas and mechanisms to regulate territory, manage conflict, and establish order and security.*

Clearly, Example 2 is at a much more general level than Example 1. This is an important point, since the level of generalization adopted by a group will affect the level of detail within the standards, the kind of comprehensiveness the standards aim for and, ultimately, the number of standards the group produces.

To understand this issue it is important to understand the concept of levels of generality as it applies to declarative, procedural and contextual knowledge. Both declarative and procedural knowledge can be ordered in somewhat of a hierarchy in terms of levels of generality. For declarative knowledge, the top level of the hierarchy includes concepts and principles; at a lower level, facts and episodes, being more



specific, encompass less information. Similarly, macroprocesses, the most general type of procedural knowledge, incorporate a range of sub-abilities or processes such as strategies and tactics, while lower-level procedures, such as the algorithm, are limited to a narrow, prescribed range of action. Contextual knowledge, since it is a composite of declarative and procedural knowledge, shares the characteristics of both: it is possible to have factual knowledge of the use of a complex procedure, yet one could also use a simple algorithm to determine the limits of a principle.

In short, declarative, procedural and contextual knowledge can be organized in a hierarchic format based on level of generality. From a strictly cognitive perspective, standards are perhaps best defined as the high-level declarative, procedural and contextual knowledge that are important within a domain. Ideally, one might say that standards should articulate the highest level of concepts, generalizations, macroprocesses and contextualized versions of these components.

The Structure of Benchmarks

Regardless of their positions on standards, most groups acknowledge the need to identify expected or anticipated performance at various developmental levels. These statements of expected knowledge and skill at different developmental levels are referred to as "benchmarks." To illustrate, consider the following content standard within mathematics: demonstrates number sense and an understanding of number theory. At the twelfth grade level, the benchmark or expected level of performance might be described in the following way: demonstrates a comparative understanding of the real number system and its various subsystems. At the eighth grade level, the benchmark or expected level of performance might be: represents and uses numbers in a variety of equivalent systems including integers, fractions, decimals and percents; demonstrates an understanding of primes, factors, multiples, ratios and proportions.

Theoretically, benchmarks could be identified at all grade levels. However, the trend seems to be toward developing benchmarks at a few key levels. Within this model, benchmarks are provided at four levels, roughly corresponding to grades K-2, 3-5, 6-8, 9-12. In all, our study resulted in 157 different standards and their related benchmarks. These standards are organized into nine major categories as follows:

- **Science:** 34 standards, 507 benchmarks
- **Mathematics:** 8 standards, 125 benchmarks.
- **History:** U.S. History: 37 standards, 143 benchmarks; World History: 31 standards, 138 benchmarks; Historical Perspective: 1 standard, 12 benchmarks.
- **Geography:** 18 standards, 251 benchmarks.
- **Communication and Information Processing:** 5 standards, 125 benchmarks.
- **Thinking and Reasoning:** 6 standards, 68 benchmarks.
- **Working with Others:** 5 standards, 48 benchmarks.
- **Self-regulation:** 5 standards, 56 benchmarks.
- **Life Work:** 7 standards, 68 benchmarks.

We developed and applied a particular process for the identification of the standards and benchmarks. A full description of the process for individual subject areas is beyond the scope of this article (for a full report, including the identification of the process, all standards, and all benchmarks at four levels, see Kendall & Marzano, January 1994).

How Standards Organize Information

From a strict cognitive perspective, one could construct a case that a standard should identify a concept, generalization or macroprocess at a level of generality that accommodates the benchmark statements found beneath it. However, while performing our analysis, we frequently found that the range of knowledge and skills within benchmark statements required a more general heading. Thus, a standard, as articulated in this report, might better be thought of as a category of closely related ideas within a subject discipline.

A standard provides a way of organizing core information — those benchmarks that identify important declarative, procedural and contextual knowledge. This organization itself may provide information on how "pieces" of knowledge can be

sequenced, logically or psychologically, for students' ease of learning. In our work, the standards we have developed reflect both the character of the draft materials available to us and the model we have developed for characterizing knowledge. There are other ways that benchmarks might be grouped, however; and, except for the caution that developmentally sequenced information should not be lost, there appears no compelling reason why districts or schools should not feel free to organize benchmarks in whatever way they find most useful.

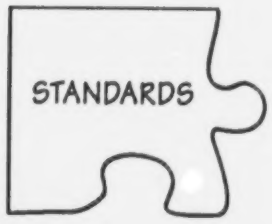
How can Standards be Used?

There are a number of ways that standards and benchmarks from our study can be used. Before describing them, we must underscore that our model represents certain basic assumptions and a particular view of knowledge that, hopefully, have been well-defined for the reader. Other assumptions and other views of knowledge would, no doubt, produce a very different articulation and organization of standards. Consequently, a school or district should understand that the information we present may be adapted or adopted into standards that are more consistent with their assumptions and perspective of knowledge.

Before using standards and benchmarks, a school or district should make some fundamental decisions and address some basic issues. In this section, we consider five important questions that a school or district should address before it adopts a standards-based approach to schooling.

1. In what format will benchmarks be articulated?

One fundamental question that should be addressed as early as possible is the format in which benchmarks will be articulated. There are two basic formats a school or district might use. One approach to defining benchmarks is as leveled sets of declarative, procedural and contextual knowledge. Clearly, this is the approach we have adopted. However, a quite different approach is to state benchmarks as performance tasks. In an earlier section, we discussed the option of stating standards as high-level declarative, procedural and contextual knowledge versus the option of stating them as performance tasks. These same options must be considered when constructing benchmarks.



The benefit of constructing performance tasks is that they commonly include more than one benchmark. This combining can provide teachers with a creative and powerful way of approaching content. However, if performance tasks are codified and used as a means to define curriculum, the same problem arises as when standards are articulated as performance tasks — namely that of restricting the manner in which students can demonstrate their knowledge and skill in a given domain.

2. How many standards and benchmarks will be articulated?

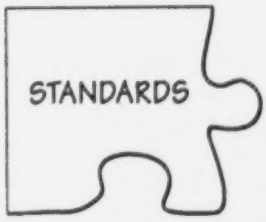
In our work thus far we have reported 1541 benchmarks embedded within 157 standards. Clearly, a school or district could not expect a student to demonstrate competence in all of these (although they may be a part of instruction). Sheer numbers would make such a system untenable. Given that there are 180 days in the school year and 13 years of schooling (assuming students go to kindergarten), there are only 2,340 school days available to students. If all benchmarks in this report were addressed, this would mean that students would have to learn and demonstrate mastery in a benchmark every 1.5 school days, or more than three benchmarks every week.

This illustrates that a school or district will surely have to select from the standards and benchmarks presented in this report if they wish to construct a system in which students are to be held accountable for each benchmark. A reasonable number of benchmarks seems to be about 600, distributed in roughly the following way:

Level I:	K-2:	75
Level II:	3-5:	125
Level III:	6-8:	150
Level IV:	9-12:	250

3. Will all selected benchmarks be considered necessary to demonstrate competence in a standard?

One possible way to alleviate the problem of too many benchmarks is to consider benchmarks as



exemplars rather than necessary components of a standard. Using this option students would be held accountable for demonstrating a mastery of a sample of the benchmarks within a level for a given standard as opposed to all the benchmarks within a given level. To illustrate, consider the benchmarks (below) for the science standard, "Knows the forms energy takes, its transformations from one form to another, and its relationship to matter."

Level I

- *Knows that the sun applies heat and light to earth*
- *Knows that an energy source, like a battery within a circuit, can produce light, sound and heat*
- *Knows that an object in a beam of light can cast a shadow, while other objects might bend or transmit the light*

Level II

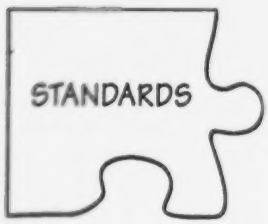
- *Knows that things that give off light often give off heat*
- *Knows that mechanical and electrical machines give off heat*
- *Knows that when warmer things are put with cooler ones, the warm ones lose heat and the cool ones gain it until they are all at the same temperature*

Level III

- *Knows that energy comes in different forms, such as light, thermal, electrical, kinetic (motion), and sound, which can be changed from one form to another*
- *Understands that whenever the amount of energy in one place or form diminishes, the amount in other places or forms increases by the same amount*
- *Knows that temperature changes in a sample of matter are related to the loss or gain of thermal energy by the sample*
- *Knows that energy comes to the earth from the sun as visible light and electromagnetic radiation; the amount and type of radiation depend upon the absorption properties of the atmosphere*
- *Knows that energy changes involved in physical or chemical changes can be measured in the form of heat*
- *Knows that energy can be harnessed to do work, which is represented by the quantity of force applied to an object times the distance the object moves in the direction of force*

Level IV

- *Knows that heat energy in a material consists of the disordered motions of its colliding atoms or molecules*
- *Knows that any interactions of atoms or molecules involve either a net decrease in potential energy or a net increase in disorder (entropy), or both*
- *Knows that transformations of energy usually produce some energy in the form of heat, which by radiation or conduction spreads into cooler places, so that less can be done with the total energy*
- *Knows that characteristic energy levels associated with different configurations of atoms and molecules means that light emitted or absorbed during energy transformations can be used to provide evidence regarding the structure and composition of matter*
- *Knows that some changes of atomic or molecular configuration require an input of energy, whereas others release energy*
- *Knows that the difference in the strength of forces involved in nuclear particles and those associated with molecules are reflected in the differences in energy released in nuclear and chemical reactions*
- *Knows that energy transformations occur whenever the nuclei of very heavy atoms, such as uranium or plutonium, split into middleweight ones, or when very light nuclei, such as those of hydrogen and helium, combine into heavier ones*



A school or district that takes the "exemplar" approach to benchmarks would require students to demonstrate competence in a selected number of benchmarks per level. For example, a school or district might require students to demonstrate competence in two out of the three benchmarks for Level I; two out of three for Level II; four out of six for Level III; and five out of seven for Level IV. This approach would allow a school or district to "exceed" the recommended limit of 600 benchmarks discussed in the preceding section. It also would allow for more flexibility within the classroom in that individual teachers would have the option to use those benchmark components which they judged as most applicable for their students. However, this approach also results in less continuity of coverage within a content domain since different teachers will no doubt select different benchmark exemplars to illustrate student competence within the levels for a given standard.

4. Will student performance be reported using course grade or standards?

Currently, most schools and districts report student progress using appropriate grades for broad academic areas organized within courses. However, current research and theory indicate that courses of the same title do not necessarily cover the same content (Yoon, Burstein & Gold, undated).

If a school or district wished to use traditional grades but implement a standards-oriented approach, they would ensure that the benchmarks that have been identified would be distributed systematically throughout the various courses within content areas. Any two courses with the same title would not only cover the same benchmarks but also place the same relative importance on the benchmarks they cover. The school or district could also determine which percentage of the grade each benchmark would command. Clearly, this would provide more precision for course descriptions and produce an equivalence between "identical" courses that is not often found today.

In summary, traditional grading practices and standards-based assessment are not incompatible. A school or district simply must distribute and weight the standards that have been identified across the various courses in a systematic, well-reasoned fashion.

The second reporting option a school or district might take is to report student progress by benchmarks. That is, rather than assign a single grade to a course, a teacher would report progress in some way for each benchmark covered in the course. In effect, for assessment purposes only, each benchmark component would be considered independent of the others covered within the course. When this approach is taken, schools and districts commonly employ rubrics as opposed to grades. A rubric is a description of the levels of understanding or skill for a given benchmark. For example, below is a rubric for the Level II mathematics benchmark "Understands the role and function of place value":

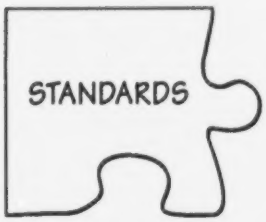
4. Demonstrates a thorough understanding of the role and function of place value and provides insights that are not obvious when using the concept of place value.

3. Demonstrates a complete and accurate understanding of the role and function of place value as it relates to estimating or calculating addition, subtraction, multiplication and division.

2. Displays an incomplete understanding of the role and function of place value as it relates to estimating or calculating addition, subtraction, multiplication or division.

1. Has severe misconceptions about the role and function of place value as evidenced by severe place value errors in addition, subtraction, multiplication or division.

Commonly, one of the described levels within a rubric, in this case the 3, is designated as the targeted level of skill or knowledge. In effect, if a task were constructed to help assess a student's ability in this area, a description of achievements on the task would parallel this reporting rubric, but be couched in terms of the task performance.



Successful achievement on the task, that is, meeting the performance standard, would provide some evidence that the student had reached a 3 on the reporting rubric. Reporting out by benchmarks would, of course, require a record-keeping system that is far different from that currently used in most schools and districts.

5. Will all students be required to meet all standards?

A major decision facing a school or district that wishes to emphasize content area standards is whether students will be required to meet a targeted level of knowledge and skills. This approach is reminiscent of the mastery learning approach of the 1970s and early 1980s (see Levine & Associates, 1985) and the more recent outcomes-based approach or OBE approach (Spady, 1988). In the context of the reporting rubric described previously, a mastery or outcomes-based approach would mean that students would be required to receive a score of 3 on each benchmark. If a student did not meet the standard for a benchmark (i.e., did not obtain a score of 3 on the rubric), he or she would be provided with additional instructional opportunities until he or she could meet the required proficiency. Of course, such a system makes extreme demands on resources. In a traditional system, no extra resources need be used if a student does poorly in a course. In a mastery or OBE system, each student who does not meet a standard must be provided with whatever instructional and curriculum resources are necessary to ensure that the student meets the requirements. A variation in the theme of a comprehensive mastery or outcomes-based approach is to require that students meet the performance standards on some, but not all, benchmarks. Those benchmarks that are applied to all students would be considered a set of core requirements.

In summary, there are many important decisions a school or district must make regarding the implementation of a standards-oriented approach to schooling. In this section, we have discussed five of the decisions that deal with the nature and function of standards and benchmarks and the extent to which students will be held accountable for them.

Conclusion

In this article we have briefly described a comprehensive study currently in progress at the Mid-continent Regional Educational Laboratory (McREL). That study attempts to articulate a systematic process for identifying content standards and benchmarks and to use that process on the reports currently being produced by expert groups in mathematics, science, history, geography, the language arts and workplace basics. Although we have had to work with draft documents in some areas and will not complete the study until the fall of 1996, our efforts thus far have resulted in what we believe is a useful snapshot of the nature and content of standards and benchmarks as described in the various national reports. School and district educators who wish to use our findings, incomplete as they may be, should consult *The Systematic Identification and Articulation of Content Standards and Benchmarks: Update* (January 1994) available from McREL.

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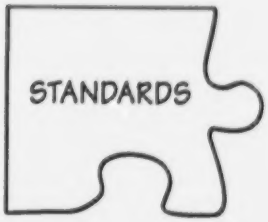

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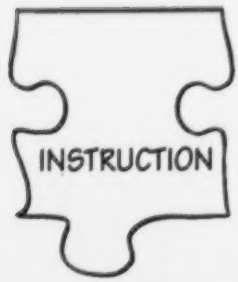


LEARNER-CENTERED PRINCIPLES: A FOUNDATION FOR THE REDESIGN OF INSTRUCTION AND SCHOOL REFORM

By Barbara L. McCombs

As educators struggle with mandates to reform standards, assessment, curriculum and instruction in our nation's schools, there seems to be little in the way of sound principles upon which to base reform decisions. In response to this need as well as the need being advocated by a growing number of educators for learner-centered models of schooling, we began a project between the Mid-continent Regional Educational Laboratory (McREL) and the American Psychological Association (APA) in 1990. The goal of this project was to provide a sound knowledge base on learners and learning, derived from a synthesis and integration of research from psychology and education. The result was a document published in 1993 entitled, *Learner-Centered Psychological Principles: Guidelines for School Redesign and Reform.*

At a holistic and comprehensive level, the twelve principles outlined in this document lead to a new model and perspective for practice that facilitates learning, motivation and school achievement. The principles form the knowledge base for a learner-centered model that focuses attention on what should not be ignored in educational reform. Thus, the learner-centered model is a foundation to undergird other reforms (in instruction, curriculum, assessment and other structural aspects of schooling). We believe that, if this learner-centered foundation is ignored, even the best programs won't work in reaching all students, especially those who are most alienated and see school as irrelevant.

What a learner-centered model helps teachers and other educators understand is that human beings — individual learners — bring with them a complex array of unique needs, capacities and strengths while at the same time sharing certain fundamental qualities. The inherent need to grow, live, and develop in a positive direction, for example, is common to all learners. What best supports these inherent capacities and distinctive characteristics? To find out, we are creating a synthesis of what it means to be learner-centered.

What is a Learner-Centered Model?

Many educators, including teachers and administrators, equate a learner-centered model of schooling with strategies that meet self-esteem, affective or other non-academic student needs. They express concern that a focus on students' non-academic needs can lead to lessening the emphasis on academic achievement and learning. They sense a conflict between learner- and learning-centered approaches. In sorting this out, Goldenberg (1991) contrasts these two views of how students learn and the conditions under which learning is optimized.

The first view focuses on the *learner* and emphasizes that learning is a natural process guided by individual learner's goals, arising from the activity itself and interactions with others stemming from the activity. In this view, students try to make sense of their experience by constructing knowledge, meaning and understanding. Current constructivist, social constructivist and intrinsic motivation theories support this view (e.g., Deci & Ryan, 1991; Gardner, 1991; Gardner & Boix-Mansilla, 1994; McCombs, 1991, 1993; Oldfather, 1992, 1993).

In the second view, focusing on *learning*, the emphasis is on the role of well-done explicit teaching in enhancing learning. This includes teaching procedures such as stating goals to students, summarizing prior learning, clearly presenting information, checking for understanding, modeling successful performance, guiding student practice until learners are independent, and providing correctives and feedback on student performance. Cognitive theories of learning and instruction support this view, such as those of Glaser (1984), Marzano & Pickering (1991), Resnick (1987), Shuell (1986,

1993) and Walberg (1990).

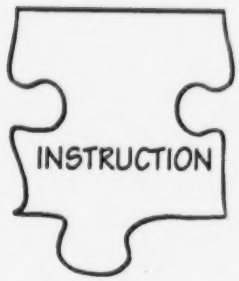
Since research can be found to support both views, it has been argued that they should be reconciled (Goldenberg, 1991). We couldn't agree more and believe that the *Learner-Centered Psychological Principles* provide a knowledge and research base for the integration of what we know about factors impacting learners and learning. Because the *Learner-Centered Psychological Principles* are an integration of research from a variety of disciplines studying learners and learning, they are concerned with both the learner and learning. That is, the current knowledge base suggests that focusing on learner needs and capacities in the context of understanding how learning occurs, uniquely for each learner, requires such an integration for maximum learning and motivation. The *Principles* logically lead to the integration of learner and learning perspectives as well as promote a view that puts the learner focus in the forefront.

The *Learner-Centered Psychological Principles* (Table 1, page 18) provide the foundation for integrating what are referred to as *learner*-centered versus *learning*-centered approaches. The integration of these approaches is a framework that we refer to as the Learner-Centered Model. This model defines whether an educator's practice is based on an understanding of the nature of the individual learner (his or her characteristics, cultural and family background, experiences, talents, needs) — and an understanding of what we know about learning.

Focusing on the learner should not be interpreted as meaning there is no concern with learning achievement or what we want all students to know and be able to do as a result of schooling.

Rather, the Learner-Centered Model, by focusing on the individual learner, and supporting that learner's learning in ways that are consistent with both the research on learning and that learner's personal learning style, is what provides the foundation for all learners doing better on relevant and appropriate measures of achievement and learning chosen at the classroom, school or district levels.

A learner-centered model is thus based on and integrates the best of what is known about learners and learning. By looking holistically and comprehensively at the research and theory base, it is possible to surface fundamental principles that define factors impacting learning for individual learners. Deriving from this model is a perspective referred to as "learner-centeredness."



Learner-centeredness is a perspective that takes the learner's unique frame of reference into account in designing educational experiences that meet the academic and nonacademic needs of the person. The learner is actively involved in planning and evaluating the learning process and content, thereby making learning personally relevant.

Learner-centeredness is implicit in many new educational programs such as cooperative learning, whole language, and performance-based curricula and assessment. Whether or not these programs are learner-centered, however, depends on the perspective from which they are implemented. Three features are present in learner-centered educational programs. First, a learner-centered program is one in which the learner is actively engaged in creating his or her own knowledge and understanding. Second, the learner's history, cultural perspectives, interests, goals, needs, ways of perceiving, thinking and self-expression are attended to and respected. Finally, the learner's unique individual differences (e.g., in learning rates, styles, development, talents) are adapted to and accommodated. To be learner-centered, the model requires all three features.

How are Programs Based on a Learner-Centered Model Different from Conventional Educational Programs?

Traditional programs are teacher- or curriculum-centered. A teacher-centered program is one in which the teacher plans, directs and evaluates the learning and is the one responsible for the creation, delivery, and evaluation of instruction. A curriculum-centered program is one in which theories and research on how knowledge is structured prescribe the learning process. For example, in mathematics, the hierarchy of facts and

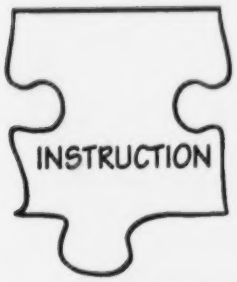


TABLE 1

THE LEARNER-CENTERED PSYCHOLOGICAL PRINCIPLES

Principle 1: The nature of the learning process. Learning is a natural process of pursuing personally meaningful goals, and it is active, volitional, and internally mediated; it is a process of discovering and constructing meaning from information and experience, filtered through the learner's unique perceptions, thoughts, and feelings.

Principle 2: Goals of the learning process. The learner seeks to create meaningful, coherent representations of knowledge regardless of the quantity and quality of data available.

Principle 3: The construction of knowledge. The learner links new information with existing and future-oriented knowledge in uniquely meaningful ways.

Principle 4: Higher-order thinking. Higher-order strategies for "thinking about thinking" -- for overseeing and monitoring mental operations -- facilitate creative and critical thinking and the development of expertise.

Principle 5: Motivational influences on learning. The depth and breadth of information processed, and what and how much is learned and remembered, are influenced by: (a) self-awareness and beliefs about personal control, competence, and ability; (b) clarity and saliency of personal values, interests, and goals; (c) personal expectations for success or failure; (d) affect, emotion, and general states of mind; and (e) the resulting motivation to learn.

Principle 6: Intrinsic motivation to learn. Individuals are naturally curious and enjoy learning, but intense negative cognitions and emotions (e.g., feeling insecure, worrying about failure, being self-conscious or shy, and fearing corporal punishment, ridicule, or stigmatizing labels) thwart this enthusiasm.

Principle 7: Characteristis of motivation-enhancing learning tasks. Curiosity, creativity, and higher-order thinking are stimulated by relevant, authentic tasks of optimal difficulty and novelty for each student.

Principle 8: Development constraints and opportunities. Individuals progress through stages of physical, intellectual, emotional, and social development that are a function of unique genetic and environmental factors.

Principle 9: Social and cultural diversity. Learning is facilitated by social interaction and communication with others in flexible, diverse (in age, culture, family background, etc.), and adaptive instructional settings.

Principle 10: Social acceptance, self-esteem, and learning. Learning and self-esteem are heightened when individuals are in respectful and caring relationships with others who see their potential, genuinely appreciate their unique talents, and accept them as individuals.

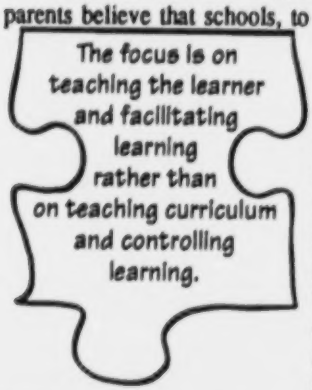
Principle 11: Individual differences in learning. Although basic principles of learning, motivation, and effective instruction apply to all learners (regardless of ethnicity, race, gender, physical ability, religion or socioeconomic status), learners have different capabilities and preferences for learning mode and strategies. These differences are a function of environment (what is learned and communicated in different cultures or other social groups) and heredity (what occurs naturally as a function of genes).

Principle 12: Cognitive filters. Personal beliefs, thoughts, and understandings result from prior learning and interpretations become the individual's basis for constructing reality and interpreting life experiences.

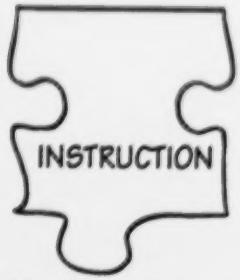
concepts may dictate the order of instruction. In a learner-centered program, on the other hand, both the curriculum and delivery of instruction are important elements; but they are considered within the context of the frame of reference and needs of each learner. The focus is on teaching the *learner* and *facilitating* learning rather than on teaching *curriculum* and *controlling* learning.

There is little argument that traditional modes of instruction are no longer adequate. Students operate as "whole persons" with intellectual, emotional, social and physical needs. In addition, students' behavior is based on their perceptions and evaluations of situations from their own orientation — an orientation that considers meaning and value relevant to personal and cultural contexts. Because conventional education so frequently is not based on an understanding of learners and learning, it does not incorporate student perspectives, needs and talents.

More and more educators, researchers and parents believe that schools, to be most effective, should treat the student as a whole person. This means building on students' cognitive and social competencies, giving all students the same chance to blossom in all areas or aspects of life and learning. Educators also are concerned with making schools more equitable, making schools more just, and respecting the integrity of every child. This requires a greater sensitivity to the social and emotional needs of all children.


The focus is on teaching the learner and facilitating learning rather than on teaching curriculum and controlling learning.

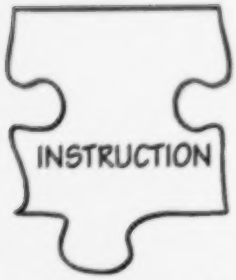
In spite of agreements about the need to focus on learner needs as well as learning outcomes, it often appears that human issues matter little because they are infrequently discussed in policy reports authored by panels of business executives, academicians, politicians and leaders of professional organizations, all of whom are far removed from the day-to-day life in schools. These experts characterize the problems with education as including low student achievement scores, lack of clear standards, too little time in the classroom, a lack of choice in schools to attend and a poorly structured teaching profession. Poplin and Weeres (1993) argue that such problems are no more than consequences of a much bigger one: Too many administrators, teachers, students and parents feel alienated and believe that school is irrelevant.



Many students are frustrated by the lack of caring and relevancy in their schools. This is true for urban, suburban and rural students of all ability levels; but it is particularly true for marginalized students for whom issues of race and culture can be sources of alienation. More students of color are entering schools, and are finding the dominant school culture to be in conflict with their home culture. Many teachers have difficulty working with ethnic minority students. Understanding and accommodating different frames of reference can be an enormous and sometimes overwhelming challenge.

Not only are students left wanting, but teachers also feel frustrated. Teachers say that relationships with students have suffered as they feel pressured to cover curriculum and prepare students for tests. They also report a lack of administrator support and relationships with administrators that are mostly centered around rules and regulations. Teachers complain of not being trusted or respected by legislators, parents and, sometimes, colleagues. Policymakers send mandates without knowing what is really going on in classrooms. Teachers feel confused and "put upon" by the mandates because they often do not take into account the realities of schooling and bringing about change.

Administrators share teachers' pressure to meet policy-driven demands and are frustrated because they have little time to devote to the fundamental issues of teaching and learning or to meeting with teachers about their work in classrooms. Administrators often are the ones who are called upon to negotiate problems between teachers and parents, having to walk a fine line between the two. In short, such forms and degrees of alienation among such key participants make it hard for schools to do their best.



The Learner-Centered Psychological Principles

The principles shown in Table 1 are intended to be understood as an organized knowledge base that supports a learner-centered perspective or model. Thus, the principles cannot be treated in isolation if maximum learning is to occur for *each student.* The first 10 principles subdivide into those referring to metacognitive and cognitive, affective, developmental, and personal and social factors and issues. The final two principles cut across the prior principles and focus on what is generally known about individual differences in learners. They can be summarized in their categories as follows:

Cognitive and metacognitive principles (Principles 1-4)

Cognitive and metacognitive principles have to do with how a learner thinks and remembers. These four principles address the way all learners construct meaning from information and their own experiences. Our minds work to create organized and sensible views of the world, and to fit new information into the structure of what we already know. The process of thinking and directing our own learning is a natural and active one and, even when it is subconscious, occurs all the time and with all of us. What is learned, remembered and thought about, however, is unique to each individual.

Affective principles (Principles 5-7)

Affective principles describe how beliefs, emotions and motivation influence the way in which and how much people learn. These three principles deal with the influences of our thinking and emotions on learning; they state that how much we learn and remember is influenced by how personally relevant new information is to us as well as how successful we perceive we will be in learning that information. Our personal beliefs and expectations influence how motivated we will be to learn. In turn, our motivation to learn influences how much we will learn and how much effort we will invest in learning.

Developmental principle (Principle 8)

The developmental principle describes capacities for learning that are known to develop or emerge over time. This principle is based on research on changes in human capacities and capabilities over the lifespan. In general, all humans proceed through identifiable progressions of physical, intellectual, emotional and social development. This developmental progression is influenced by unique personal characteristics that may come from genetic or environmental factors. The important point is that we all learn best when material is appropriate to our developmental level and presented in an enjoyable, interesting and challenging way.

Personal and social principles (Principles 9-10)

Personal and social principles describe the role that others play in the learning process, including the way people learn in groups. These two principles reflect research showing that we all learn from each other and can help each other learn. If learners are in respectful and caring relationships with others who see their potential, genuinely appreciate their unique talents, and accept them as individuals — both learning and feelings of self-esteem are enhanced. Positive student-teacher relationships define the cornerstone of an effective learning environment, one that promotes both learning and positive self-development.

Individual difference principles (Principles 11-12)

Individual difference principles describe how unique backgrounds and capabilities of individuals influence learning. These two principles help explain why individuals learn different things and in different ways. Although the same basic principles of learning, thinking, feeling, relating to others and development apply to all of us — what we learn and how this is communicated differs in different environments (such as cultural or social groups) and as a function of our genes or heredity. Out of our environment and heredity we create unique thoughts, beliefs and understandings of ourselves and our world. Appreciating how these differences and understandings may show up in learning situations is essential to creating effective learning environments for all students.

Each of the twelve principles applies to all of us. As complex human beings, we all approach learning situations with fundamental human qualities in common. At the same time, however, we bring unique styles of learning that are based on our prior experiences and/or special characteristics. It is our common characteristics that can define a general model of schooling; it is our unique characteristics that can point to the adaptations schools need to meet.

How the *Principles* Fit into the Reform Agenda

Basing school reform efforts on an understanding of the *Principles* leads to a concept of schooling that has at its center a concern with each student and that student's maximum achievement and development. This model advocates making decisions about learning standards, curriculum, assessment and instructional approaches after taking into account learner needs, capacities and frames of reference. A focus is on creating quality learning environments and the personal relationships that make that possible based on an understanding of learners and learning. There is a balance of individual learner considerations and what is known to be best for all learners. There is also a balance between concerns with learner needs and concerns with all students learning the standards and content that define an educated and productive citizen.

It needs to be emphasized that a learner-centered perspective is not just one more recipe for better learning to add to the pile of educational trends that are popular today. Focusing on the learner provides a research-based foundation for school design decisions. It provides coherence to site-based decision making, cooperative learning and higher-order thinking and gives educators a way to develop, organize and plan significant educational innovations. By focusing on students and bringing their frames of reference to the implementation of educational innovations, we believe more students will be successful and satisfied in school, and current innovations and reforms will be more successful in improving motivation and learning for all students.

What Can the Learner-Centered Model Contribute to Learning and Teaching?

Teaching in ways derived from a learner-centered model and perspective can enhance students' motivation to learn as well as their actual learning and performance. When students can be actively involved in directing their own learning and make important decisions about classroom procedures, instruction and curriculum; when students believe that teachers listen to them and try to get to know them; when students think that what they are learning is somehow connected to the real world and their personal interests; with teacher guidance and support, students' natural curiosity will guide their learning. Students become more effective, more interested and more independent learners. They develop skills, such as learning to question, analyze, think about their thinking, and make decisions. They also develop social skills and a deeper respect for their classmates, teachers and other individuals; and they realize how much they can learn from each other.

Teachers also report that having good relationships with students, other teachers and administrators is crucial if they are to feel good about their teaching. In fact, a common reason teachers report being in education is to connect and make a difference with students. Teachers we have talked with about what matters most to them as professionals say things such as:

> *"For this reform agenda to work, it's got to be about making connections with kids. I know I'm being successful when I connect. That's when I know all kids have the capacity to learn."*

> *"Teaching is hard, particularly with all the issues kids bring into the classroom today. But I have support from my kids and that gives me everything I need."*

> *"Centering on the kids and what they needed was, quite frankly, a career saver. I moved away from delivering the*

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same old curriculum in the same way year after year to a new and different approach to deal with human beings, the kids in my classroom."

Learner-centered practices also can make an educator's life more satisfying. Less energy is needed to devise new ways to keep students involved in class and to try to make learning interesting to them. With this approach, there is less demand to keep students occupied so they are not disruptive to other students. And there is more time to spend with individual students.

The point is, when educators put learners in the center of teaching and learning, they do what works best for each student as an individual. As depicted by a recent film, "Why Do These Kids Love School," produced by Dorothy Fadiman in 1990 and described by Raywid (1992), schools where students love to be are characterized as: being child-centered; providing for individual responsibility for learners; emphasizing motivation; providing a personalized and supportive environment; actively engaging students with the material to be learned; focusing on the importance of the human community; and interweaving the affective, cognitive and social aspects of development throughout the school years.

We are convinced that an approach that is explicitly sensitive to the learner offers a promising and improved way of teaching. It also offers a way of directly addressing student feelings of alienation, lack of motivation to learn, and subsequent problems such as classroom discipline and school dropout. As a result, student learning and achievement are improved.

Conclusions

Learner-centered schools and classrooms are characterized by staffs who value students and their uniqueness and diversity. These staff members understand individual differences, learner needs and the research on how students learn. From this understanding and a grounding in content and effective pedagogy, they are equipped to implement the instructional strategies, curriculum and assessment approaches and management structures that facilitate learning for *all* learners. This includes those processes and structures that best support teachers and administrators in having the time, flexibility, and interpersonal supports to design and implement learner-centered practices. These practices will be as varied as the students being served in any one school and community. In spite of this variability, however, there are specific characteristics or indicators of learner-centered practice at the school and classroom levels. Table 2 (page 25) outlines some of the most important characteristics or practices that can define a learner-centered perspective and its associated practices in schools. A similar list of Characteristics of Learner-Centered Classrooms, Table 3, begins on page 26. These practices become indicators of learner-centeredness to the degree that schools and classrooms have a focus on individual learners' needs, capacities and perspectives and include a majority of these characteristics.

Underlying all these characteristics is the commitment of school staff to changes in school design to meet learner and learning needs more effectively. This commitment is based on the assumption that we need to understand the learner's reality and to support capacities existing in the learner to accomplish desired outcomes. Learner-centeredness begins with a full comprehension of how the learner understands his or her world and approaches the process of learning inside and outside the classroom. It looks with the learner at what learning means and how it can be enhanced from within by drawing on the learner's own unique talents, capacities and experiences when creating educational experiences for achieving desired learning outcomes.

As educators at all levels of the system begin to change the designs of their schools, one factor seen as critical is that they move from *reforming* to *transforming* their thinking. "Transformation" means to completely change the form of something. When we have a new insight and it alters the way we look at things, our thinking has been transformed. We never see things the same way again.

In our observation, when such a transformation occurs, it is most frequently

anchored in the educator's altered point of view — a point of view that consistently includes seeing and accepting the learner's needs and interests from the learner's *frame of reference*. With this shared point of view comes an openness to actually hearing the learner's voice. Such "hearing" comes about naturally as a result of such a transformation rather than being something one must make an effort to do. This results in an increased respect for the learner as exemplified by a deeper responsiveness to the learner's perceptions. It also results in a sincere intention to accept the validity of the learner's thoughts and feelings based on the learner's internal logic and *not the educator's imposed viewpoint.*

With this shift, the recurrent theme of working toward a shared vision of developing a community of learners naturally evolves. A *sense of shared responsibility* for the education of our nation's children emerges. Teachers are co-learners and students and community members come together to share resources, ideas and experiences to improve the education of all learners. There is a spirit of hope, commitment to a better community, and willingness to dream and achieve what has never been tried before. It is this spirit that contributes to the transformations in education and student achievement that are occurring in learner-centered schools across the country. Education is seen as a community affair that involves everyone in a lifelong process. The principles underlying a learner-centered perspective and the involvement of the entire community can make this journey into the infinite possible for all learners.

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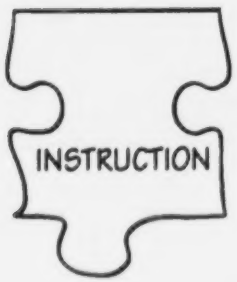

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This article is based on a larger monograph, *The Learner-Centered School and Classroom*, by Barbara L. McCombs, Diane Swartz, Raymond Wlodkowski, Jo Sue Whisler and Jerome D. Stiller, dated January 1994.

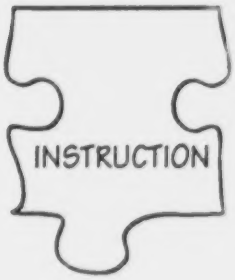


TABLE 2

CHARACTERISTICS OF LEARNER-CENTERED SCHOOLS

At this school, you can notice that the students are...

- talking openly with teachers and administrators
- happy to be at school
- involved in school activities
- proud of the school and respectful of its resources
- involved in positively resolving their own conflicts
- encouraged to get involved and take risks
- involved in learning and school governance decisions
- respectful toward school staff, administrators, and teachers
- open and friendly

In this school, characteristics of the climate and culture are that...

- administrators and teachers actively solicit student input
- students are greeted by name and known by staff
- school calendar accommodates different student needs and cultures
- high daily attendance rates are evident
- positive student growth and development is a visible theme
- opportunities for long-term (multi-year) teacher relationships are provided
- all students are expected to achieve high academic and personal standards
- intrinsic versus extrinsic incentives for learning are emphasized

At this school, qualities of administration, support staff, and teachers are that they are...

- emotionally responsive to all students
- visible and accessible to students
- respectful of students
- sensitive and responsive to individual differences and needs
- trusting of students
- actively listening to students
- in mentoring relationships with students
- sharing decision making with students
- sensitive to students' mood levels

At this school, noticeable physical characteristics are...

- few locked doors
- wide variety of learning spaces and activities
- displays of student work
- learning resources that are accessible to all students
- variety of comfortable places for conversations
- multi-age groupings of students
- active involvement and participation of parents
- active involvement and participation of business and community members
- school open at flexible hours to accommodate student and family schedules
- cafeteria foods and school decor that reflect students' varied cultures
- classes with low student-teacher ratios
- flexible blocks of time to accommodate different learner needs and teacher planning time
- health, mental health, and social services available in school

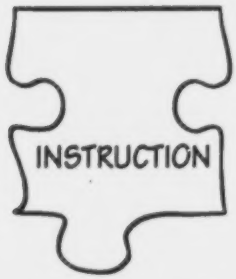


TABLE 3

CHARACTERISTICS OF LEARNER-CENTERED CLASSROOMS

In learner-centered classrooms, the *students*...

- choose their own projects
- work at their own individual pace
- take part in class discussions by their own choice
- show excitement about learning new things
- choose their own learning goals
- work with students of different ages, cultures, and abilities
- demonstrate their knowledge in unique ways
- are actively engaged and participating in individual and group learning activities
- go beyond minimal assignments

In learner-centered classrooms, the *teacher*...

- makes it clear that he/she has high expectations for all students
- helps students interpret and use their mistakes as learning opportunities
- listens to and respects each student's point of view
- provides opportunities for all students to be acknowledged and appreciated
- encourages and facilitates students' participation and shared decision making
- provides structure without being overly directive
- solicits and incorporates all students' ideas and suggestions
- facilitates successful learning experiences for all students
- helps students clarify their own learning goals
- pays attention to the mood of each student
- encourages students to think for themselves
- solicits and incorporates students' reflections on the meaningfulness of learning activities
- avoids competition and social comparison
- questions students to make sure they understand what they are learning
- uses personal knowledge and experience of students to explain new concepts
- encourages students to share their feelings and responds to them
- validates students' unique contributions to discussions
- emphasizes student enjoyment of activities
- gears the pace of instruction to how students are learning and progressing
- helps students refine their strategies for constructing meaning and organizing content

In learner-centered classrooms, features of the *curriculum* are that...

- tasks are designed to stimulate students' varied interests
- learning activities are learner outcome-driven
- content and activities are organized around themes that are meaningful to students
- explicit opportunities are built in for all students to engage their higher order thinking and self-regulated learning skills
- tasks are challenging and developmentally appropriate to unique student characteristics
- activities help students understand and develop their own perspectives
- learning activities are global, interdisciplinary, and integrated
- curricula are not grade-level specific
- learning activities are challenging even if students have difficulty
- content and activities reflect those of real life
- activities encourage students to work collaboratively with other students

TABLE 3, CONTINUED

CHARACTERISTICS OF LEARNER-CENTERED CLASSROOMS

In learner-centered classrooms, the *instructional strategies and methods*...

- use time in variable and flexible ways to match student needs
- give students at different developmental levels opportunities to learn different things
- include learning activities that are personally relevant to students
- involve students in creating individualized learning plans
- give students increasing responsibility for the learning process
- provide questions and tasks that stimulate students' thinking beyond rote memory
- adapt to individual student needs with multiple methods of instruction
- help students refine their understanding by using critical thinking skills
- link prior knowledge and new information in ways that are meaningful to students
- support students in developing and using effective learning strategies
- support students in developing and using self-management, self-monitoring, and self-inquiry skills
- provide for student choice of how they want to work (i.e., individually, collaboratively)
- include peer learning and peer teaching among the instructional methods

In learner-centered classrooms, the *assessment system*...

- includes a guided practice phase that is adaptable to student needs
- assesses different students differently
- assesses all students' demonstrations of higher-order thinking skills
- gives students individual feedback that is informational (clear, comprehensible, and immediate)
- evaluates students privately, not publicly
- includes student input in design and revision
- monitors progress continuously in order to provide feedback on individual growth and progress
- provides for multiple plausible responses and creative constructions and expressions of knowledge, rather than focusing on predetermined problem and answer sets
- provides appropriate opportunities for student choice of types of products for demonstrating achievement of educational standards
- promotes students' reflection of their growth as a learner through opportunities for self-assessment
- gives all students multiple opportunities to succeed
- allows diversity of competencies to be demonstrated in a variety of ways
- embeds assessment of learning progress in curriculum and assessment, blurring the lines between curriculum, instruction, and assessment
- recognizes student effort
- measures student motivation, attitudes, and affective reactions about the curriculum as well as their cognitive skills, strategies, and knowledge

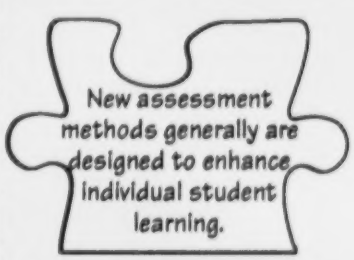
INDICATOR SYSTEMS, ACCOUNTABILITY AND CLASSROOM ASSESSMENT

By Louis F. Cicchinelli

Large-scale attempts to reform education in this country are not new. In the 1950s through the 1970s, reform efforts were based on the assumption that providing rational, scientific data to support the value of new instructional techniques and methods would be sufficient to cause people to apply that information. In the 1980s it was expected that merely enacting state mandates would result in education reform (Sashkin & Egermeier, 1993). History shows that neither strategy was particularly successful at stimulating lasting and meaningful change. The current movement is based on a more systemic approach to reform that requires a reexamination of the foundation of the nation's education systems. The comprehensive restructuring approach of the 1990s is considerably more complex than merely implementing a new instructional technique, designing a new curriculum or improving organizational effectiveness. State and local leaders are collaboratively reexamining and altering the meanings and values of their organizations. The impact of these efforts is likely to extend to communities, professional development institutions and all levels of the nation's education system.

As part of the current reform initiative, teachers are being asked to consider the use of alternative assessment strategies in their classrooms. Terms such as authentic assessments, portfolios, enhanced multiple choice items and extended open-ended responses have become commonplace assessment terminology, and are the targets of staff development sessions across the nation. These new assessment methods generally are designed to enhance individual student learning and to better assess an expanding definition of student achievement. It is also important to recognize that these emerging measures have accountability implications that extend well beyond the classroom; they are often elements of a comprehensive education indicator system. In fact, Vermont, California, Maryland and Michigan are among a growing number of states that are redesigning or modifying their state-wide accountability programs to include these non-traditional assessment methods (Bond, Friedman & Van Der Ploeg, 1994).

The purpose of this article is to encourage the reader to view student performance assessment within the much larger context of an indicator or accountability system designed to monitor the overall progress and effectiveness of state and local education enterprises. In this article, the term "accountability system" is used synonymously with "indicator system" as is often the case in the literature. "Accountability system" is a generic term and should not be confused with "accountability" (to hold someone responsible for attaining a specific outcome) as a purpose of assessment. To illustrate this distinction consider that an indicator or accountability system may have multiple purposes including informational, diagnosis, certification and accountability.



In its report to the National Center for Education Statistics, The National Study Panel on Education Indicators (1991) persuasively argues that the assessment of an educational system must be built on a broad range of indicators capable of meeting the diverse information needs of multiple stakeholders (e.g., policy makers, administrators, teachers, students, parents) if it is expected to support and maintain the reform movement now underway. From this vantage point it is apparent that student performance data are only one type of indicator, and that accountability is only one

purpose of a comprehensive education indicator system. While the selection of local assessment practices will be shaped by redesign choices made regarding other aspects of the education system — content and performance standards, curriculum organization and structure, and instructional strategies — it is also useful to consider the role of student performance information as a key indicator of system effectiveness. Because monitoring systems, especially with respect to learner outcomes, are built in large part on individual student assessment information, it is inevitable that the sets of data collected by local administrators and teachers will have the dual purposes of individual student and system accountability.

The potential advantages to local administrators and teachers of viewing local student assessment decisions from the larger accountability system context are many. First, examining the system design parameters and considerations will highlight a broader range of measurement options and data collection points than traditionally has been considered at the local level. Second, articulating the expectations various stakeholders have for accountability information will help identify opportunities for more cost-effective data collection. Third, translating these expectations into clearly stated purposes for collecting various types of indicator data will encourage use and guard against potential misuse. Finally, linking specific indicators to specific decisions (e.g., high stakes decisions regarding promotion and graduation; low stakes decisions regarding individual strengths and weaknesses), local jurisdictions can better establish the necessary levels of reliability and validity for performance measures, target staff training, identify data collection sampling frames, and estimate the associated development and implementation costs.

Information about the functioning of educational systems, including the performance of their students, has been collected in one form or another since education systems were formalized. So why the present focus on changing the established approaches to accountability? Perhaps the answer is best provided by examining the vast array of expectations held for accountability systems and, by extension, for education systems of the future.

Expectations of Education Accountability Systems

Policy makers, educators, administrators, researchers and the public have come to view indicator or accountability systems as a mechanism that, at least in part, will: stimulate reform; restore the credibility of the nation's educational systems; enhance equitable access and opportunity for all students; monitor the progress of reform efforts; and encourage more community, parent and student involvement in the education process.

Stimulate Change

Policy makers argue that student performance assessment is an effective lever for encouraging change in other parts of the education system. Assessment data, especially when used for accountability purposes, provide a goal to aim for and thus motivate students, parents, educators or the system to alter behaviors or practices. Certainly there is ample historical evidence to support the notion that educators do match the content of instruction to the content of standardized assessments. The emergence of alternative student assessment methods is a direct response to the need to better align curriculum and instruction with assessment (e.g., both require the application of information and skills in meaningful real world contexts). Hopefully, the negative consequences of misalignment such as "teaching to the test" will be avoided since both assessment and curriculum will reflect agreed upon student learning standards and goals. In fact, new assessment methods together with well articulated standards may make "teaching to the test" an effective instructional strategy. Clear statements of who will be accountable for what are expected to introduce more creativity, student involvement and instructional practices consistent with learner needs into the teaching and learning process.

Restore Credibility

The current call for educational reform stems, in large part, from public unrest about the health of the nation's education system and a lack of

confidence in the system's ability to develop graduates who are competent to meet the demands of life in the next century. In the arena of international comparisons, this concern has led to speculation that the nation's competitiveness in global markets eventually will be undermined. There is a widespread belief among government and business leaders that our international partners in Europe and Asia have education systems that produce graduates with high levels of literacy and competence, and that the United States needs a similar system in order to maintain a strong international presence and regain its strategic advantage in world markets. Certainly a well prepared, productive and competent workforce is essential to reach this goal. Therefore, it is not surprising that the important policy questions regarding the outcomes of the education system have gradually evolved from asking "how many" to "how much" to "how good," and that the search for the better and more sophisticated outcome and impact indicators and measures is being guided by a call for higher standards of performance on a wider and more complex array of outcomes.

From a national, state and local perspective, forging strong links between educational standards, student competencies and accountability systems is expected to renew the value and meaning of a high school diploma, as well as restore public confidence in the effectiveness of education systems. Because accountability systems will be built on indicators selected by both educators and business leaders, the level of achievement attained will have consequences inside and outside the education system. That is, students no longer will be passed through the system without demonstrating their competence and the level of performance demonstrated will have clear implications for further education, career options and job opportunities.

Enhance Equity

It is apparent that assessing student performance against new standards with new methods will not, in and of itself, improve performance. The education system also must change. By developing delivery standards (i.e., requirements for education system inputs), policy makers expect to ensure that all students have equal access and opportunities to learn. Special needs populations such as limited English proficient students often are excluded from standardized testing sessions in an effort to enhance building, district or state performance results. Indicator systems designed to include disaggregated data will better account for the needs and performance of these student groups in the examination of educational effectiveness and equity. Using a consistent set of indicators to assess all students can help assure that judgments about competence are made on the basis of what they know and can do, rather that on personal or community characteristics.

Monitor Reform Progress

If successful educational reform is to become a reality, then the progress and impact of innovations must be continually examined. Accountability systems must be able to respond to the public requests for information about how their children are performing and how they compare to those in other schools, districts, states and nations. Reliable accountability data also can provide the information needed by legislators and administrators to make more informed decisions concerning the future direction of schooling practices and policy.

Encourage Community, Parent and Student Involvement

Communities, and parents in particular, are now acutely aware that local schools may not be meeting the educational needs of their own students. Many consider their children to be ill prepared to effectively fulfill their future roles as citizens, workers and family members. Communities and parents now expect clear information about the progress and current competency levels of their students. The availability of education standards, often developed with input from parents and other community members, has enabled communities to expand their demands for accountability for what is taught to include accountability for what students have learned. Further, alignment of state and local

assessment and accountability practices is expected to make comparisons across local and state boundaries more meaningful. Parents will be able to choose among the educational opportunities more effectively or, in some jurisdictions, to establish charter schools when acceptable options are not readily available.

Changes in classroom assessment practice that are consistent with the demands of a comprehensive accountability system are expected to influence student behaviors and motivate them to attain higher levels of achievement. With clear goals, the use of more appropriate assessment methods, and an understanding of what they must know and be able to do, students can assume more responsibility for their own learning. Through the use of multiple and diverse performance validation methods, students will be assured of a fair and complete assessment of their capabilities. When assessment is made an integral part of curriculum, students can become more actively engaged in the learning process because they better understand what has been accomplished and what remains to be completed.

Characteristics of Accountability Systems

An indicator or accountability system comprises a set of indicators that collectively provide an accurate and complete picture of an entire enterprise. In education, an accountability system is composed of indicators that provide information about how well schools, teachers and students are performing. By the choice of indicators, system designers specify who will be held accountable, for what, and to whom. The design of complex multipurpose systems that are both fair and useful is difficult, and the design process always involves tough decisions. Usefulness, write Shavelson et al. (1987):

> *depends on much more than just the dissemination of indicator data. It also hinges on factors such as the indicators contained in the system, how they are conceptualized and measured, the level at which they can be aggregated, and the way in which they are analyzed and reported.*

In the following section seven major characteristics of education accountability systems are presented. Each element is present in all indicator systems; the way a characteristic is implemented is guided by the local or state context in which the system will operate.

Purposes

The definition of system purpose(s) should be guided by the information needs of the various groups that have a stake in education, which will be determined largely by the expectations they have of the education system. Some of the most common purposes of accountability systems are to:

- **inform** students, parents and teachers about student progress, strengths and weaknesses, and current competency levels;
- **certify** the qualifications, competency and accomplishments of educators and administrators;
- **monitor** the learning process by examining what is taught, instructional practice and other aspects of the school environment; and
- **evaluate** the effectiveness of existing or new policies, programs or practices.

System Components

A comprehensive accountability system consists of a number of components, each intended to monitor an important aspect of the overall education enterprise. These multidimensional systems can be configured in a variety of ways, but the approach taken often depends on how the underlying education system is modeled. For example, a product development model might lead to organizing indicators around education system inputs, processes, outcomes and, perhaps, contexts. A goals-oriented model of the underlying system might lead to grouping indicators around a set of locally- or state-established goals, or even the six national education goals. The Special Study Panel on Education Indicators (1991) recommended that

indicators be configured around a set of key issues such as learner outcomes, quality of education institutions, societal support for learning, equity and so on. A fourth possibility might be to specify accountability system components that correspond to various parts of an education system — resources (fiscal audits), schools (accreditation), teachers and staff (personnel evaluation), instruction (program evaluation), and students (performance assessment).

Focus of Inquiry

The scope of accountability systems can vary dramatically. The boundaries of a system should be established in relation to the information needs of the stakeholders in the jurisdictions responsible for collecting and disseminating the indicator data. Virtually any dimension of an education system can be used to limit the focus of accountability. A jurisdiction might choose to focus attention on a single feeder system; selected subject matter areas such as mathematics and science; specific grade levels such as 4, 8 and 12; or even selected special-needs student groups dispersed across classrooms and buildings.

Unit of Analysis

The unit of data collection and analysis selected will depend to a great extent on the accountability purpose(s) and focus established. In education, the levels at which data can be collected are fairly clear: state, district, school, classroom, student. The first consideration in establishing a unit of analysis for specific indicator data is the likelihood that disaggregated information, not currently required, will be needed in the future. If the possibility exists, and cost considerations permit, it is best to err on the side of collecting more detailed information than is currently necessary. Individual student data can be aggregated to the district level, for example, but the reverse is not always true. A second consideration guiding the unit of data collection and analysis is the type of audiences that will receive the data and the manner of reporting it to them.

Responsibilities

Accountability systems differ in whether states or local districts have primary responsibility for deciding what data are collected and how they are organized and reported. These differences often reflect legislative requirements, local tradition regarding decentralization, and current political circumstances. In all cases, however, assignment of responsibilities must be made for system design, data collection, analysis and reporting. Generally, when state and local jurisdictions share the responsibility for system design and operation the result is very powerful. Local involvement provides a sense of ownership which in turn minimizes corruption of the indicator data. State involvement helps assure the alignment of data across jurisdictions so the information better supports the information needs of state level decisionmakers. Overall, shared responsibility can dramatically increase the effectiveness and efficiency of system development and operation.

Rewards and Sanctions

State and local jurisdictions can choose to link performance on accountability indicators to specified rewards and sanctions through legislation and policy statements. For example, district policy might reward teachers in buildings in which average student performance on a state-wide test exceeds the state average. On the other hand, the state may impose sanctions on districts that do not reach an identified performance level. Sanctions may be as simple as publishing the results in local newspapers or as complex as requiring a revised school improvement plan. The effectiveness of these strategies is unclear. It is clear, however, that when stakes associated with an indicator system are high, the pressure to produce the desired statistical outcomes is great.

Indicators

An indicator is a statistic that provides information about the performance, functioning, or well being of an entire enterprise or of one of its significant features. A properly developed indicator is policy-related and problem-oriented, and incorporates a standard against which to judge progress or regression. The strength of indicators is that they focus attention on critical issues.

Indicators by themselves, however, cannot be used to identify causes or solutions. The set of indicators selected for an accountability system should provide useful information to all the groups that have a stake in the health of education in the jurisdiction in question. The quality of indicators can vary, but as a general rule the demand for valid and reliable indicators increases as the stakes associated with them increase.

Issues Influencing System Design

An examination of the history and the extensive literature on system design, assessment and measurement suggests that there are a number of overarching considerations to address and pitfalls to avoid if new indicator systems are to be successfully designed and implemented. Design teams must make difficult tradeoffs in order to develop sound accountability systems. It is best to make these decisions explicit. This section outlines some of the major issues that should be considered, if not resolved, early in the system design process.

Maintaining a Systemic Perspective

Historically, externally mandated tests have not worked as a stimulus to improve the nation's education systems. It is most important that the integrity of the current reform approach — a collaborative, systemic strategy — be maintained. Policy makers and administrators must monitor the entire change process so that changes in one component of the education system do not outstrip corresponding changes in other components. The process of reform must be iterative so that a meaningful relationship among different elements of the education system exists at all times. For example, using indicators of student performance for accountability purposes before developing credible measurement strategies and providing relevant teaching and learning opportunities will most certainly lead to abuses of the accountability process and possibly encourage legal challenges to the appropriateness of high stakes (e.g., graduation requirement) uses of assessment results.

Balancing Oversight and Improvement

In the past, little use has been made of accountability data by local administrators beyond efforts to increase test scores. The challenge to system designers is to provide accountability data that are useful for improving practice as well as for providing oversight. It can be argued that a single system designed to meet such diverse needs will not support any of these requirements successfully. Therefore, it is most important that each indicator included in an accountability system be linked to a specific purpose. Although efficiency is improved when data can serve multiple purposes, efficiency should not be the overriding requirement of a system design. Fundamental differences in the requirements for data used for improvement and those used for oversight or accountability must be considered. The fact that improvement often relies on "real time," relevant information illustrates this point.

Determining the Appropriate Level of Accountability

As already mentioned, state and local jurisdictions often share the responsibility for designing and implementing accountability systems. The division of responsibilities is sometimes quite clear, and at other times quite vague. Certainly the efficiency of a system will be dependent in part on the extent to which the assignment of responsibilities is made explicit and is mutually derived. An issue that often slips through the cracks during this process is establishing who will be held accountable when deficiencies in system or student performance are revealed. An important part of assigning responsibility includes establishing in advance who must take action to remedy a problem or to improve an unacceptable level of performance. Determining who should be responsible for which outcomes is often difficult, as previous attempts to link teacher and student performance demonstrate. The actions of teachers alone cannot be expected to overcome the range of system and environmental factors that also influence student performance; the responsibility for improving student performance is more appropriately shared by teachers, administrators, parents and students. Indicator data must be collected at a sufficiently detailed level to provide a clear link between the findings and those

responsible for making needed changes.

Balancing Statewide Comparability With Local Ownership

Statewide comparability of indicator data usually is desired so that valid comparisons across buildings and districts are possible. However, to encourage localities to support the collection of accountability data, they must be involved in the selection of indicators, some of which must address their priorities. Balancing state and local needs is both a technical and political challenge: technical in the sense that a wider range of data must be obtained cost effectively to accommodate the needs of both jurisdictions and political in the sense that a consensus must be reached about the purposes and priorities of the accountability system.

Including Non-traditional Assessment Strategies as Data Sources

Large-scale standardized tests form the core of most state accountability systems and often drive local responses. Failure to measure the full range of student accomplishments, limited overlap between test items and curriculum content, and the narrowing of curriculum by teaching to the test are among the most common criticisms of large-scale testing programs. In response to these criticisms assessment experts are calling for increased use of performance-based testing alternatives and multiple validations of performance for a single student. From the outset, designers must consider to what extent these new assessment methods will be incorporated into the systems they develop. Demonstrated effectiveness and the cost of designing and using these new assessment methods should be key factors in the debate. A reasonable solution often adopted is to use both traditional and non-traditional assessment strategies such that cross-validation of the indicator data generated is possible.

Validity and Reliability

The use of education standards is a key element of the current reform effort, but those being developed often are open to broad interpretation. Many researchers believe that performance assessments cannot be focused on them yet. Certainly, they should not be used in a high-stakes manner until validity and reliability studies are conducted and data collected demonstrating that such assessments can be reliably administered and scored, and are valid. In the absence of sufficient information about the validity and reliability of new assessment method, emphasis should be placed on multiple validations of student performance.

Making Fair Comparisons

Environmental conditions under which students live and learn can make education systems more or less successful. New assessment methods and more accountability will not alter this reality. Accurate comparisons across student groups, schools, districts, states and even countries are difficult to accomplish. It is critical that design teams consider data collection and reporting methods that allow for fair comparisons among student groups and jurisdictions. Reporting disaggregated data when equity concerns are at issue is essential. Failure to address this potential problem adequately can easily undermine the integrity of any accountability system or, worse, result in inappropriate actions or inaction by those who use the indicator information disseminated.

Ensuring Adequate Capacity

New accountability systems and new measurement methods require resources to develop and implement; and operating these more complex systems generally requires a larger commitment of personnel. Design teams should attempt to match the scope of the system developed to the state and local capacity to operate it effectively. A number of approaches to cost containment are possible: using a balance of performance-oriented and standardized tests to form the basis of indicator data; using sampling strategies to amass data for system level assessment whenever possible; focusing on selected topics according to a predetermined timetable; and distributing data collection efforts over longer time intervals.

Influence of Future Accountability Systems on Local Administrators and Teachers

It is possible to make some projections concerning the characteristics and elements of

emerging accountability systems given the research literature, current thinking, and the directions being pursued by states and local jurisdictions. Each of these speculations, if realized, will have a direct impact on local administrators and classroom teachers. The nature of accountability systems will certainly influence the organization of schools, programs offered, and assessment practices; but it also is likely that what teachers teach and how they teach it will change considerably.

Emphasis on Important Issues

Indicators should address important issues, not just those that can measured easily. Wiggins (1992) states that the concern is not so much which assessment methods are superior to others, but rather what is worth assessing. Policy makers must reexamine the purposes of testing and not merely how testing is implemented. As a result, it is expected that the emphasis of accountability will be on the most central and important features of schooling — system and educators will be held accountable for what matters. In the past, accountability has focused almost exclusively on inputs and processes. In the future, administrators and teachers can expect to be held accountable for teaching and learning in terms of the quality of students produced as measured by student outputs. They will be required to make the organizational and classroom level changes that are necessary to achieve preestablished student learning outcomes.

Focus on Performance Outcomes

Local jurisdictions can expect to shift their focus from merely the assessment of student knowledge to the assessment of both knowledge and performance. To the extent that students continue to be assessed on only factual knowledge and non-creative work, they will fail to become effective communicators, self-directed learners, collaborators, or problem solvers. And these are among the standards and outcomes for which local jurisdictions will be accountable.

Multiple Validations of Performance

No longer will a single assessment, using a single data collection method at a single point in time, be adequate to assess student performance. Teachers will be expected to assess performance levels using multiple validations — observations, traditional written tests, performance tasks, portfolios — so that momentary circumstances do not mask true performance levels. Teachers will be required to conduct these assessments routinely in their classrooms, and must find ways to effectively merge learning and assessment to accommodate the increased demand for accountability.

A performance task is one type of classroom performance assessment. It allows students to demonstrate their attainment of both content and learner outcomes. The student would be given the task and rubrics (expectations, criteria for performance) either at the beginning of a unit of study or sometime along the way. The task implies the teaching and learning of information and skills that relate to the task and unit. An example of a performance task and rubrics that go with it follows.

Example Performance Task

There is a current debate going on about giving the Black Hills of South Dakota back to the Lakota -- the Native Americans who lived on the land before the United States took it over. Analyze the history of the Black Hills, focusing on the influence the treaties had on the transfer of ownership and use of the land. To what extent did the treaties reflect a balance of cooperation and use of power? Use at least three different sources for your research (e.g., books, personal interviews, articles, videotapes, etc.). You will be working in triads to share information. Based on what you learned about the treaties and subsequent use of the land, construct an argument for or against returning the land to the Lakota. Include in your argument specific references to the use of conflict, power and cooperation during treaty negotiations and in

interactions since that time. Prepare to present your argument in a video documentary; a debate; a pamphlet written and produced for the public; a slideshow; or an oral/visual presentation to be presented at a meeting of public policy people studying the issue.

You will be assessed on and provided with rubrics for the following:

Content Standards
Your understanding of how conflict, power and cooperation in social, political and economic spheres influence the ownership and use of national resources.

Lifelong Learning Standards
Complex Thinker: Constructing Support
Your ability to provide sufficient and appropriate evidence for a claim

Effective Communicator/Producer
Your ability to effectively communicate through a variety of mediums

RUBRICS

Content Standards
Does the student demonstrate understanding of how conflict, power and cooperation in social, political and economic spheres influence the ownership and use of national resources?

4 The student demonstrates a thorough understanding of how conflict, power and cooperation influenced the treaties that gave the Black Hills to the United States; goes beyond a description; interprets and analyzes information to provide some insights into how these forces have interacted to influence the treaties.

3 The student demonstrates a complete and accurate understanding of how conflict, power and cooperation influenced the treaties that gave the Black Hills to the United States; describes how specific aspects of the treaties were influenced by these forces.

2 The student displays incomplete understanding of how conflict, power and cooperation influenced the treaties that gave the Black Hills to the United States; describes the treaties but does not explain the influences of these forces, or has some major misunderstanding or lack of knowledge related to these issues.

1 The student demonstrates severe misconceptions or lack of knowledge related to the influence of conflict, power and cooperation in the Black Hills treaties.

Constructing Support
Was the student's claim supported by a sufficient amount and appropriate types of information?

4 The student presents a clear and accurate treatment of all available evidence that addresses the argument for or against returning the land to the Lakota. In addition, the student considers what evidence is missing, and how it affects his or her argument.

3 The student, with no major errors, treats all relevant evidence that should be used to support the argument for or against returning the land to the Lakota.

2 The student's argument provides evidence for the argument for or against returning the land to the Lakota, but may not address all necessary aspects of a convincing argument.

1 The student fails to provide convincing evidence for the argument for or against returning the land to the Lakota.

Effective Communicator

Does the student effectively communicate through a variety of mediums?

4 The student uses the conventions and rules of the medium in a highly creative and imaginative way.

3 The student uses the conventions and rules of the medium to communicate.

2 The student makes significant errors in use of the conventions and rules of the medium.

1 The student demonstrates a lack of awareness or understanding of the conventions and rules of the medium.

From Marzano, et al. (1993). *A Comprehensive Model of Assessment*. Aurora, CO: McREL Institute.

Large Scale Sample Assessments

Even large scale sample-based assessments will be expanded to include multiple methods such as standardized tests, writing samples, and state- or district-wide performance tasks. Local administrators can use the comparison of these assessment results with the results of classroom assessments as a measure of local accountability. Any major discrepancies in the two sets of outcomes would be reasonable targets of further investigation. It is likely that more strategic and effective changes in local practice or content could be made.

Delivery System Standards

Most educators and the public agree that students should not bear the sole burden of attaining the performance standards set for them. The tools for success must be available in all schools. Local administrators are likely to be held accountable for delivery standards set for education systems. They will have to examine more closely what actually is being taught in classrooms; assess its relationship to the locally-adopted education standards; and ensure that classroom environments and practices promote the learning, practicing and attaining of the outcomes and standards on which they are assessed.

New Methods of Assessment

Given that a consensus can be reached on the nature of the performances required of students and systems, new methods of assessments will be needed. While developing and scoring performance tasks might be viewed as a positive staff development experience for most teachers, it also will be an burden in terms of time and added responsibility. The impact of these added assessment responsibilities, as well as other responsibilities resulting from the current reform movement, is still unclear. If existing staffs are expected to meet these demands, administrators must set realistic timelines for the related development and training efforts that will be needed.

Dynamic Design Process

To assure responsiveness of the accountability system developed, a local jurisdiction should establish an independent oversight group to monitor the planning, development and implementation phases. This team—which includes educators, parents, policy makers and testing experts—should participate in defining system goals and periodically reviewing how well the system is working. The operational system must be viewed as developmental, not static. It should be modified over time to incorporate new assessment techniques and to maintain alignment of content and performance standards, classroom practice, and assessment.

Increased Efficiency

At the local level, particular attention must be given to maximizing the usefulness of the data collected and minimizing the burden of data collection. The scope and complexity of the accountability enterprise should be continually checked against the level of resources available for operation.

Integration with Higher Education

Accountability systems must be consistent with the requirements of the higher education system. It is reasonable to assume that local administrators and teachers will have a key role in assuring that their local requirements for performance data are consistent with those of higher education institutions. Similarly, institutions of higher education must be aware of and in step with the demands of accountability systems, providing the education necessary for teachers and administrators to understand and operate effectively within such systems.

When Have We Arrived?

The complexity of the accountability issues facing educational leaders today suggests that substantial time will be needed to design, implement, test and refine accountability systems. It is useful to consider how they will know when the task has been implemented successfully. Perhaps it will be when:

- students can see what was expected of them and believe they had a fair opportunity to show what they know and can do;
- assessments are an integral part of the learning process and capture the essence of learning outcomes targeted by teachers, parents and the public;
- classroom, district and statewide assessment and accountability needs are aligned and consistent with what is known about learning and motivation;
- the results of large scale assessments match those of ongoing classroom assessments made by teachers and there is no wasted time, effort or opportunity because all classroom assessment activities inform or feed the accountability system; and
- parents, taxpayers, legislators, business leaders and other community members can see that schools are focused on important things — students are achieving the levels of academic excellence needed for the future.

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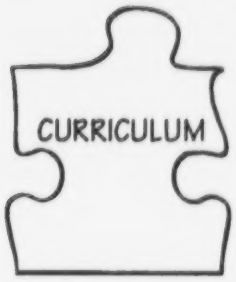


INTEGRATED INTERDISCIPLINARY CURRICULUM: A MODEL

By James M. Fanning, Joan B. Grady and Jo Sue Whisler

"We have a design for an interdisciplinary course, but getting the school's course schedule changed has been a real problem."

"The math teacher and I would like to team with the science teacher to plan some interdisciplinary curriculum, but we rarely see one another much less spend time planning together."

"I've always thought that an interdisciplinary curriculum would be more holistic but I'm not sure how such courses would help students meet the school's graduation requirements."

The Context

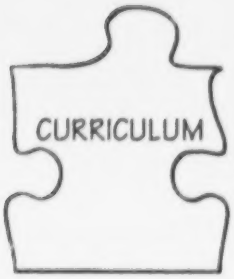
The quotes above seem to capture the essence of questions about interdisciplinary curriculum. New programs, models and innovations are described in current issues of educational journals; and many of the innovations recommend integrating subject areas—presenting curriculum in an interdisciplinary manner. But as has been shown over the years, implementing innovations in a school is easier said (or mandated) than done. No two schools are alike. An innovation must be tailored to the needs and characteristics of each school's instructional program and the people who make it work. The staff at McREL, with the input and assistance of experts in its seven-state region, have developed a reasonable model, with a concomitant process, designed to guide the development and implementation of interdisciplinary approaches to curriculum.

As non-traditional approaches to learning, interdisciplinary courses of study often clash with the usual ways of operating in schools. They confound the way we schedule, assign staff, conduct assessment, grant credit, keep records and report progress. Implementing an interdisciplinary approach impacts all of the key components of schooling: operations and management, curriculum, instruction, assessment, and classroom management. To modify these key components we must overcome obstacles that have deep-seated, conceptual roots in the way Americans view learning and schooling. As Barbara Tye has noted (1991) about people's general assumptions concerning schooling,

> *But of course the school building should consist of rooms of about that size. But of course the curriculum should consist of separate subjects, taught as if they had little or no relationship to each other. But of course the school day should be divided into six or eight approximately equal chunks of time. And by no means should children have any significant choice about what, when or how they will learn....*

These are only some of the often unconscious assumptions held inside and outside the profession. There are also deep-seated assumptions about how teachers ought to spend time and about curriculum content. The result of such widely held assumptions has been a push to emphasize mastery of discipline-specific, factual information. Lists, chronologies and formulas have taken precedence over learning how to learn; acquiring methods of inquiry and other complex reasoning processes and skills; and purposeful, reflective thought. Such pervasive assumptions, held throughout our society, are difficult to change. McREL's Integrated Interdisciplinary Curriculum Model provides tools that prompt the questioning of some of those deep-seated assumptions and enable us to consider sound alternatives to them.

A particular strength of the McREL model — what sets it apart from other interdisciplinary curriculum models — is that it provides ways to integrate interdisciplinary curriculum with the



numerous other components being called for in the reform movement (thus the name *integrated interdisciplinary curriculum model*). For example, the model offers means for linking interdisciplinary curriculum with learner-centered classroom instruction, the learning of content standards and benchmarks in any particular area as well as across content areas, and the assessment (performance assessment) of both content standards and other lifelong learning standards identified by many districts.

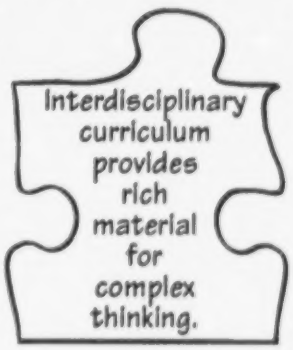
While educators are using the model and learning about a variety of concrete ways to integrate interdisciplinary curriculum with a current instructional program, the model also helps them to answer questions concerning approaches to scheduling, finding time to plan, creating a healthy environment, developing interdisciplinary *chunks* of curriculum, and developing compatible alternative assessment and instructional techniques. The model helps to identify solutions that can work in existing, unique instructional settings.

Interdisciplinarity: An Idea with Roots

The notion of integrated or interdisciplinary curriculum and instruction has been a part of the American scene for decades. It was popular in various forms in the 1920s and 1930s. John Dewey's efforts to encourage experiential learning were supported by educators; and Charles McMurry (1920), a contemporary of Dewey, documented many examples of what he called "large project units" which were very popular at the time.

With the advent of World War II, there was a strong emphasis on industrialization as the nation attempted to recover from Pearl Harbor and gear up for war. As both women and men joined the war effort, in factories and on the battlefields, schools became more compartmentalized. The emphasis was on narrow specialization to accomplish industrial goals. The Carnegie unit (approximately 50-minute periods of class time for 180 days per year) was adopted almost universally by schools as a means of indicating progress toward graduation. The high school accrediting associations used Carnegie units as a measurement of student time on task for accreditation. Following the war, Jerome Bruner and others emphasized discipline-oriented curriculum wherein the structure of the curriculum became the sole organizer for the storage and retrieval of knowledge. Interdisciplinary instruction lost favor except in a few lighthouse schools.

An indirect boost for the resurgence of interest in interdisciplinarity resulted from Benjamin Bloom's research which made it clear that lower levels of thinking, such as recall, were insufficient for learning; higher order, more complex skills were needed. Recent brain research suggests that the brain searches for patterns and connections as a way of making meaning (Caine & Caine, 1991). Interdisciplinary curriculum, by pulling together information, knowledge, and skills from a variety of disciplines, provides rich material for complex thinking and allows connections to be made as the information, knowledge and skills tend to mimic "real life." With the high dropout rates, particularly among disenfranchised student populations, there has been a call for curriculum that is more meaningful and relevant, so that students can connect what they are learning in school with what they need to survive and succeed in life. Finally, the limitations created by the Carnegie unit have become more obvious. Does spending 50 minutes a day for 180 days necessarily mean that a student has acquired the knowledge and skills taught in that class? Is such a structure even appropriate to what needs to be taught and learned in an information society? As a result of these and other issues and questions, interdisciplinary curriculum is having a resurgence.



Advantages of Interdisciplinarity

Are there other reasons why teachers and administrators should restructure time, reallocate money and alter their activities to create interdisciplinary curriculum? The very nature of interdisciplinary work in classrooms can enhance learning because it encourages the following:

- Reinforcement and refinement of knowledge and skills
- Students' participation in coherent learning experiences
- Unified process and content goals
- Students' application of content to reach higher levels of abstract thinking
- Students' engagement in analytical strategies that are applied to a variety of contexts both in and out of school
- Emphasis on inquiry, analysis, and creative problem solving
- Students' responsibility to share their knowledge and skills
- Students' participation in multisensory experiences
- Relationship of knowledge and skills between classrooms and the world

Interdisciplinarity: Variations on Perspective

The term interdisciplinary means different things to different people. In examining the common variations of definition and perspective of the term, it must be noted that the descriptions which follow embody differing degrees and means of varying from a single-discipline organization and presentation of curriculum. While these perspectives do not strictly represent a continuum, any approach is unlikely to be "pure" in its implementation and ought, in fact, to be guided by factors unique to the particular context and setting in which it exists.

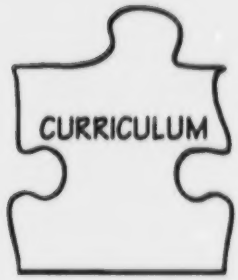
Most advocates of an interdisciplinary approach to curriculum define their approach in terms of how each discipline contributes to an understanding of subject matter and how disciplines relate to one another. These advocates are concerned to varying degrees with the preservation of each discipline's autonomy and content emphasis.

Multidisciplinary approaches are concerned with students comprehending the ways various disciplines portray a particular topic, e.g., how the Spotted Owl/logging controversy would be portrayed in economics, in history, in biology and in art. Here teachers from a variety of disciplines agree on a single theme or topic but individually, for the most part, continue to teach students in isolation. Any deliberate linking between content areas and the topic is largely left up to the student. Very little, if any, common teacher planning occurs.

A *metadisciplinary* approach compares the approaches and methods used by the disciplines to study topics like AIDS or health care.

An *interdisciplinary* approach portrays the same issue or topic using a synthesized interpretation of the perspectives of two or more disciplines (Gardner & Boix-Mansilla, 1994). That is, content is presented across the disciplines by blending teachers' approaches and students' inquiry. Students examine a topic or issue — perhaps through one of many complex reasoning processes, a particular problem, a creative-expressive project or the like — selected by teachers who have jointly planned the curriculum. Classes often are held independently of one another with occasional meetings of all students and teachers involved in the process. This approach involves more common planning and a deliberate intention to provide continuity and understanding across, between and among independent content areas.

A final variation of interdisciplinarity is a *transdisciplinary* approach. It goes beyond the mastery of aspects of a single discipline or multiple disciplines, blurring the boundaries between disciplines. It is the most complex to design, develop and carry out, particularly in a traditional setting. The learning evolves from the integration of the disciplines within a larger, overarching topic, issue or problem. In such an approach the contribution of each of the disciplines comes into play under a common set of criteria or standards to provide a richer perspective on a given topic or event (Drake, 1993; Tchudi, 1991). The



interrelationships between and among disciplines become a part of a learning experience that has real life impact and connection. For example, in *A New Face on the Countryside*, author T. Silver blends the content and methods of history, geography, geology and biology to interpret environmental change in colonial America. The transdisciplinary approach requires preplanning, design work and continuous interaction among the teachers and students involved in the process. Blocked time in the schedule is almost essential to maximize this approach.

As noted above, the distinctions presented are rarely implemented in pure form. McREL uses the word *interdisciplinary* to describe its model. In so doing, it is not adopting the definition of interdisciplinary described above but, rather, uses the term to denote curriculum that is somehow organized across content areas. While McREL's bias probably is most closely reflected in the transdisciplinary perspective, McREL believes that: (1) there are instances when it makes most sense to teach and learn some knowledge and skills from the perspective of a single discipline; and (2) each school, depending on its context, must define and implement a variation of interdisciplinarity that is appropriate to its particular setting.

The McREL Integrated Interdisciplinary Curriculum Model

The designers of McREL's Integrated Interdisciplinary Curriculum Model believe that all approaches to the integration of subject matter, from multidisciplinary to transdisciplinary, have a legitimate role to play in some way and at some time in the educative process. The McREL model provides a method for defining and implementing a variant of interdisciplinary studies for a particular school. Based on recent research in a number of schools (Grady & Jesse, in press), the designers of the McREL approach stand by contextually determined approaches, resisting the "one best model" for integrating disciplines or elements of the curriculum. They found teachers could tailor interdisciplinarity to their local circumstances creatively. As a result, the model suggests adopting a definition of interdisciplinary studies for a specific setting, possibly creating a "hybrid." The purpose of the model is to assist teachers to help young people gain a better understanding of the complex world in which they live, not to promote a single approach. The goal is to develop a site-specific approach to curriculum that goes beyond the fractionated conglomeration of information given students when disciplines are separated and isolated. Interdisciplinarity can help bridge the gaps caused by separation and isolation of teachers and students. It has the potential to:

- address complex questions;
- join colleagues and students in the investigation of broad issues;
- explore disciplinary and professional relations;
- investigate problems that have traditionally been beyond the scope of a single discipline;
- construct, study and integrate diverse kinds of knowledge, on a small scale or grand scale (adapted from Klein, 1990).

The inherent complexity of interdisciplinary subject matter and the need for teamwork among the participating teachers benefit from a model for systematic planning, thus the McREL Integrated Interdisciplinary Curriculum Model. Essentially the model assists team members in jointly defining the various topics to be studied, determining what knowledge and skills are to be learned and identifying the subject matter province of each of the disciplines involved; e.g., what aspects of a topic like the Spotted Owl/logging controversy are best explained by history or geography rather than biology. In addition, the model provides a process for determining how the team members, as discipline representatives, interact.

McREL's Integrated Interdisciplinary Curriculum Model focuses on two basic educational aims: (1) the construction of sets of interdisciplinary curriculum materials, called *chunks*, that guide and facilitate students' potential to comprehend important, complex issues and events; and (2) the facilitation of the creation of a plan for implementing those *chunks*. These aims take form through the performance of four key

operations that drive the model: (A) creating an operational definition of interdisciplinary studies that has potential to be implemented; (B) creating interdisciplinary curriculum materials - *chunks;* (C) designing assessment methods for interdisciplinary studies; and (D) planning ways to integrate interdisciplinary studies with existing school structure. These operations are interdependent—each generating information that becomes useful in making further decisions—and are addressed by a team of teachers. (McREL recommends three teachers, each from different traditional content areas.)

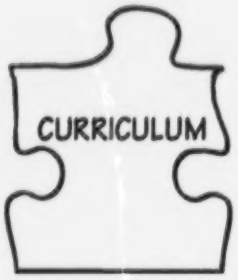
A. Creating an operational definition

Using a district's performance standards or graduation requirements and the experience and expertise of team members as a starting point, the team creates an operational definition of interdisciplinarity. This definition is based on one of the models described previously and matches the needs and circumstances of a particular setting. This stage includes the examination of potential modifications of scheduling, staffing patterns and the use of time. (A closer examination of these critical elements is part of operation "D".)

The next step is to establish principles to guide its actual practice within the school setting. A particular strength of the McREL model is its focus on and inclusion of principles and concepts of motivational, developmental and cognitive psychology — *the Learner-centered Psychological Principles* (APA and McREL, 1993), a bringing together of the research on learning and the learner. Developing interdisciplinary curriculum that is guided by the Principles facilitates the creation of conditions and relationships that result in students reaching their potential as learners.

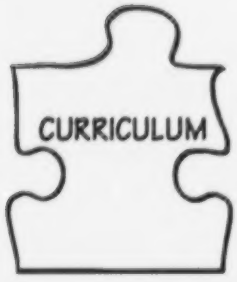
B. Creating interdisciplinary curriculum materials

The McREL model relies on a thematic approach to curriculum development. Therefore, the model facilitates team members in identifying a unifying *theme* (an overarching idea, concept or generalization, at the highest level of abstraction, that transcends disciplinary boundaries and allows for the examination of issues from a holistic perspective), one that all team members can use to focus the concepts and principles of their respective disciplines. The *theme,* (1) enables team members to make connections among seemingly disparate elements across disciplines so they can move on a common direction, select compatible areas of focus to study, and define the scope of their common efforts; and (2) help students think in terms of identifying connections, relationships, and patterns beyond their immediate experience. Themes become arenas through which they can orient their perception of the complex and diverse world they experience. Ultimately, using the theme as a guide, teams develop an interdisciplinary *chunk* of curriculum. A curriculum *chunk* includes an action plan with lessons, activities and approaches *(designed experiences)* to help young learners construct a well-reasoned meaning for the *focus topic* (one of many possible specific contexts within which the theme is explored or developed; a proposed center of attention to which students and teachers relate their sense of awareness and purpose). A *chunk* enables students to comprehend, interpret and apply an interdisciplinary theme in practical and meaningful ways (Grady et al., 1993).



Using a series of graphic organizers—diagrams, concept maps and flow charts—it is possible to visualize and map relationships and connections among the various concepts and principles from the represented disciplines. The whole process is grounded in the concepts, principles and processes of the disciplines which are collaboratively identified and serve as lenses through which to interpret proposed topics. Additionally, if districts have identified lifelong learning outcomes or standards (knowledge and skills that cut across content areas and/or have to do with the world of work and life in general), these are connected and interrelated such that students have an opportunity to learn and master these as well.

In developing the action plan of *desired experiences,* the model introduces a set of complex reasoning processes that, when applied to the knowledge and skills of the disciplines, promote the extension and refinement of knowledge as well



as its meaningful use and application. Such processes provide frames for interesting learning experiences for students. While the McREL model may include the complex reasoning processes articulated in *Dimensions of Learning* (Marzano, 1992), it does not require their use.

To help in the development of the action plan, in addition to other suggestions, three lesson/activity templates are provided. These templates can be characterized as generic methods of inquiry and action: (1) a deductive/ quantitative approach to problem-solving often used for scientific experimentation and research; (2) an inductive/qualitative approach to problem-solving used for field studies, case studies and historical research; and (3) a creative/expressive approach to problems and action used by artists, designers and craftspersons. Each of the generic methods is based on procedures that have been used within the major disciplines for decades.

After having dealt with the issues, questions and decisions raised by the McREL model, an interdisciplinary curriculum *chunk*, will have been developed. The Spotted Owl/logging example is illustrative of what might be developed. The overarching *theme* selected by a team might have been "conflict in nature" with the Spotted Owl/logging as the specific *focus topic*. *Designed experiences* might include individual and group inquiry activities that can be seen as steps leading to an understanding of a *focus topic* ("The Future of the Spotted Owl...") and its overarching *theme* ("Conflict in Nature"). These inquiry activities may become part of a formative task that might include a debate about the future of the owl with supporting evidence from different sources; quantitative experiments or research; qualitative observations and research; and/or creative applications such as research on the owl's habitat, analysis of timber sales, timber species growth rates, opinion surveys, interviewing, creative writing, bird-watching, report writing and an analysis of logging technology.

C. Designing assessment methods for interdisciplinary units

In addition to preliminary "practice" tasks, a *chunk* includes a final, summative task that requires students to engage in a performance task that has them go beyond lessons, activities and methods to a more applied, synthesized or inventive level. These tasks usually carry authentic, real-life meaning for the young learners who carry them out and allow teachers to assess the degree to which students have acquired the knowledge and skills targeted for learning in the chunk.

McREL's highly regarded Comprehensive Assessment Model (Marzano et al., 1993) anchors this aspect of the Integrated Interdisciplinary Curriculum Model. An overview of this model is provided that addresses the following:

- an investigation of ways to embed assessment within learning experiences as an ongoing process;
- a method for designing and developing assessment rubrics for both formative and summative tasks;
- an exploration of ways to motivate students by engaging them in the assessment process; and
- a way of designing realistic assessment tasks that key to performance standards.

Assessment becomes an insight-giving operation, for "...more than any other activity, designing assessment creates a deep understanding of what needs to be taught and how to teach it best" (Bradford & Randolph Stiff, 1993). And, it provides an appreciation of how assessment can engage students in setting high standards, empower them as "experts" and improve performance (Wiske, 1994; Kleinsasser, 1993).

D. Interdisciplinary studies and the existing structure

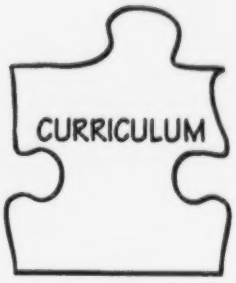
A final aspect of the McREL model is the exploration of ways to "fit" interdisciplinary studies into a school's unique setting and program; this process plays a key role in teams' deliberations when completing the other three operations. If anything can impede implementation of an innovation, a school's structure or operations and management can. Basically the issue can be

defined in terms of finding time and space. Interdisciplinary studies require time for collaboration, time for group and individual planning and time for reflection—things that are not included in the deep-seated assumptions most people hold regarding the structuring and operation of schools.

As noted earlier, a school's structure has typically been determined by the combination of a few deep-seated notions: the 50-minute period, the separation of disciplines, student grouping patterns and related staffing patterns. To find the additional time needed for teaching and learning much-needed interdisciplinary perspectives, existing school structures must be altered. It has been found that time often can be generated by: reallocating time scheduled for instruction, staff development and activities; increasing the time allocated for the school day and/or the school year; or altering staffing patterns and student group size, e.g., some teachers work with more students for a period of time while other teachers meet or plan (Raywid, 1993).

Conclusion

Setting up an interdisciplinary program is no small task. It requires the support of the administration, teachers, parents and community members. At the time of implementation, unexpected issues often surface including, among others, differences in teaching and learning styles, student-teacher relationships, "turf" concerns, and the willingness to trust students to be involved in the design of their learning environment. Flexibility, a sense of humor, a sensitivity for when it is appropriate to lead and when to follow, and a passion for doing what is best for students will all contribute to a successful interdisciplinary venture. The opportunity to make a significant move toward restructuring schools is available through the implementation of interdisciplinary curriculum; the chance to make a difference in the nature of the education of our young people is, perhaps, an even more important reason to consider interdisciplinarity.



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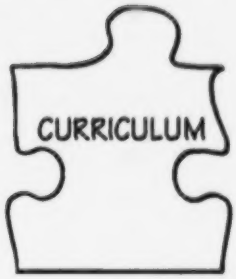

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